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CONTENTS

THE EARTH'S RESOURCES IN THE SERVICE OF MAN 97
by Dr. Philip V. Cardon
Director-General, FAO

EDUCATING FORESTERS 99
by Hardy L. Shirley

SAWMILLING IN SWEDEN 103
by B. Thunell

AVALANCHE AND TORRENT CONTROL IN THE SPANISH PYRENEES 111
by FAO Staff

AT THE HALF-CENTURY MARK 114
by Richard E. McArdle

FORESTRY AND TECHNICAL ASSISTANCE IN PAKISTAN 117
by Robert K. Winters

COMMODITY REPORT 124
Roundwood, 1946-54

WORK OF FAO
A Summary of Work in Forestry, 1954-55 130
Technical Assistance Reports 136

EQUIPMENT NEWS 138

NEWS OF THE WORLD 141

THE EARTH'S RESOURCES IN THE SERVICE OF MAN

THIS year is the tenth anniversary year not only of the United Nations itself but also of the Food and Agriculture Organization, which is an associated specialized agency, for FAO, the first of these specialized agencies, came into existence in Quebec on 16 October 1945.

It is important to recognize the wide scope of our activities. FAO is concerned with all the earth's natural renewable resources. We are concerned with sea and lake, forest and farm, from the point of view of how they are serving man and how they might be made to serve man better. We are concerned, for instance, with maintaining and improving the possibilities of farm land; with bringing back into production farm lands which have been adversely affected by poor farming; with gaining food from land which has never yet supported human life. We are concerned with improving the plants and livestock which the land supports and with protecting them from disease and pest. We are concerned with the welfare and efficiency of the people who derive their living from the land; with the quality of their implements and their stock and plants, with the systems of tenure under which they work their land, with the ways in which they get credit to finance their operations, with the ways in which governments help or hinder their efforts. We are concerned with processing, storage, distribution and marketing of the products of nature.

And through all these efforts runs a continuous thread of concern with what are man's needs, particularly what are his nutritional needs, how the earth is satisfying those needs and how it could be induced to satisfy them to an even greater extent.

As the time has passed, FAO's work has come to fall into three different branches of activity, and in all of these branches, as we look back, can we see progress.

A fundamental activity, and yet one which receives little public attention, is our collection from all over the world of information dealing with food and agriculture, and our issuing of it in compiled form — our presentation of a world's-eye view of world food and agriculture.

We have, in the years, reached a point where hardly any significant contribution to knowledge of world agriculture announced anywhere escapes our attention. And spanning this great international system of pooling of day-to-day information are our over-all surveys. In 1950, for instance, more than one hundred countries and dependent territories co-operated in the most ambitious census ever attempted of world agriculture. This census covered about two-thirds of the land area of the globe, and the information gained is being published at present.

In 1948, and again in 1953, we carried out world forest inventories which took a great step forward in estimating

Cover photograph: *Successful tests have been carried out in Ontario, using a helicopter for delivering flexible hose to the scene of fire-fighting operations. The end of the hose is attached to a pump at the water supply source. The hose itself in connected 100 meter sections is paid out from the helicopter over the tree tops, and a water pressure of 40 to 45 kilograms is obtained at the outlet which is about equal to the pressure maintained in a hose laid out over the ground on rough terrain. The hauling-in of the air-borne hose is somewhat more difficult to perform, but this is more than compensated by the advantage of the quick laying-out of the line.*

By courtesy, Ontario Department of Lands and Forests.

distribution of forests and of tree species over the globe and the rate at which we are drawing on them. At present, our Fisheries Division is working on the preparatory stages of a world survey of living aquatic resources.

Tackling common problems

A second branch of our activities might be described as " catalytic "; bringing about international action on problems common to groups of nations. For instance, there is the FAO-sponsored Near East Regional Desert Locust Control Project through which thirteen countries have combined to fight this ancient foe of the farmer. There is the recently-established European Foot and Mouth Disease Commission in which a group of countries has joined together to promote a common program of research and counter-measures against a disease which in the outbreak of 1951-53 cost the European stock industry $600 million.

A most interesting example in this group of activities is FAO's twenty-nation Committee on Commodity Problems, for it shows more than merely the extent to which FAO has come to influence the development of world agriculture through promoting international cooperation and the degree to which this influence has come to be considered an inevitable part of the international scene. It is also a significant demonstration of the change in outlook on production and trade in agricultural products in the past decade or two.

The Committee on Commodity Problems was set up by the fifth session of the FAO Conference, in 1949, to consider the food and agriculture surplus situation, particularly as it was governed by international currency exchange problems.

At that time its function was envisaged to be that of an international forum on commodity problems arising out of hard currency stringencies, but as events developed this conception proved to be too narrow. So a special session of the FAO Conference, in 1950, widened the powers and responsibilities of the CCP, and the same thing was done again by the sixth session of the Conference in 1951. The seventh session met at the end of 1953 in an atmosphere of doubt and apprehension over surplus stocks of a number of agricultural commodities being accumulated by several governments. This was a paradoxical situation in a world in which too many people were ill-fed, but the situation did exist, and it was not the first time. In the early 1930's, as in 1953, the surplus situation caused wide concern, but then the nations could agree on nothing except the desirability of continuing to restrict production to prevent further falls in prices.

What was 1953 to do about the same problem?

The 1953 Conference session called on FAO's member nations to continue to expand food production but with greater emphasis on the foods in greatest need. It stated principles of international responsibility which it suggested countries should observe in disposing of their surpluses, and it directed the CCP to do what it could to facilitate those disposals.

The CCP, in turn, set up a special Consultative Subcommittee on Surplus Disposals in Washington where, for nearly a year now, countries marketing surplus stocks or buying them have been able to consult with all the other countries which might be affected by the transactions.

The CCP also carried out two surveys of the possibilities of using surplus stocks to assist underdeveloped countries. The first was last year's pilot survey in Egypt of the possibilities of using surplus dairy products, most especially of dried skim milk, in supplementary feeding programs. The second was a pilot survey in India of the potentialities of financing development of food producing resources by using surplus stocks as a credit backing.

It is early yet to say how this modern approach to the surpluses which once brought economic disaster will work. The situation is still serious, but the early signs are encouraging. There are some signs of restriction of production, it is true. But there is also being planned considerable redeployment of agriculture away from the products for which there is least demand. Consequently, surpluses are now accumulating at a much slower rate, and stocks are being reduced in such a way as to cause a minimum of harm to normal trade and only after the fullest consultation with other countries which might be affected.

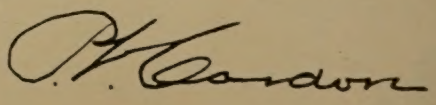
Our methods of dealing with surpluses today, in fact, are just about as different as they could possibly be from the methods of a couple of decades ago. I believe that FAO may justifiably claim some of the credit for this new outlook.

Technical Assistance

The third branch of our activities is our direct help to technically backward countries under the Expanded Technical Assistance Program. I shall not speak of this in detail, for a great number of our projects have received much publicity and are reasonably well-known. This program was started only in 1951, and one would not be justified in expecting too much progress. But, in fact, the speed with which it has become effective has been surprising.

In the beginning, governments asking for assistance under the Expanded Program were often somewhat uncertain about what they needed. They were sometimes inclined to ask for too many experts in too many different fields of development without fully considering that a program of advice from FAO would have to be followed up by their own programs of action. But four years have wrought a huge change in the governments' attitudes. Now they are concentrating their requests on assistance in solving their major problems, and more and more they are basing programs of development on the experts' recommendations. To list the various fields in which the aggregate of twelve hundred experts assigned at various times to about sixty countries are and have been working would be to write a catalogue of virtually every branch of exploitation of the world's natural resources.

Up to the end of last year, FAO had spent a total of almost $19 million on Technical Assistance. With increased international interest in the work which FAO and the other United Nations agencies are doing in this field, we hope the present trend toward greater effectiveness will be maintained. This is essential to the improvement of agriculture, fisheries and forestry in underdeveloped countries.



DIRECTOR-GENERAL
FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS

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Educating Foresters

by Hardy L. Shirley,
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The profession of forestry seeks to aid man in living successfully with forests and manipulating them so as to obtain the maximum of human satisfaction in terms of products, services, and inspiration. Forest land makes up about 30 percent of the world's land area, hence this is no modest goal. As population grows, man increases his pressure on land resources, thereby making the achievement of this goal progressively more difficult and at the same time more necessary.

Demands on the forest can rarely be ignored or diverted while the forest is being improved. The forester must pursue his goal while meeting current demands even though, by doing so, the attainment of his goal be delayed. In this, his task is similar to that of the agriculturist and range manager, both of whom must keep their lands producing at current levels while restoring them for greater future production.

The task of educating men for this service involves building up in their minds an appropriate attitude toward their professional responsibilities and supplying them with the technical knowledge and skill to discharge such responsibilities.

True professions are characterized by requiring special education for successful practice and by devotion to the general welfare rather than to selfish goals. Foresters qualify as professional men on both counts. The great leaders in forestry have been men who subscribed to certain basic tenets that guided their approach to their goal. The tenets of the forester have to do with science and its application to human welfare. They also, of necessity, embrace certain basic assumptions about man and his place in the universe. The forester's tenets have not been stated definitively, yet they exist and guide the thinking and actions of high level foresters whatever their country of origin. Many of the tenets to which foresters subscribe are shared with others interested in man's use of natural resources.

Tenets of foresters

In a listing of foresters' tenets would appear such expressions of faith as these:

> Human life is sacred and good. It is man's highest study to protect it and to provide for its fulfillment.
>
> Man can enjoy neither freedom of action nor fulfillment of life's promises if the basic sources for his existence are inadequate or if their effective use is not understood.
>
> The earth and its resources are finite. Therefore, a limit does exist to the amount of food, fibre and other renewable resources that are available for man's use in any period of time.
>
> The earth's resources, if well developed, are ample today to provide for mankind the basic essentials for livelihood in substantially greater abundance than now is being realized.
>
> Man is privileged to use renewable resources of the land to the full extent that he provides for their continued renewal at the current or higher rate of consumption. Needless waste of renewable resources robs mankind of the potential of creating a more abundant and satisfying life. This is a sin against the men of today. Needless destruction of soil and non-renewable resources robs both the man of today and those yet unborn.
>
> Plants, animals and man respond to natural laws. Man through creative intellectual effort can discover and use natural laws. But, however imaginative man's insight or critical his tests, he is unlikely ever to discover all natural laws that govern plant and animal behavior or to understand completely his own place in the universe.
>
> The complexities and simple magnitude of physical and biologic laws that affect man are so vast that no individual can grasp them all nor reduce their application in forestry to a mathematical basis alone. Art must always play a large role in man's husbandry of his essential resources.
>
> The forest has its mysteries, its unknown and unsuspected drama. This involves countless plants and animals dwelling together in an interrelated community that makes up the life of the forest. Man should therefore approach the forest with humility and reverence. It is something sacred which should not be needlessly profaned.
>
> As man's life is sacred, so his efforts should not be needlessly wasted.

Such tenets support the forester's drive toward his goal of managing forests for human welfare. Educators in forestry share these tenets with practitioners. The former also share with teachers in general certain tenets that underlie all education, such as:

> The teacher's highest duty is loyalty to truth and to cultivate in his students the capacity to arrive at truth.
>
> Truth is rarely absolute, nor is it subject to approach from but one direction. Judgment and a sense of values are necessary to the educated man.
>
> Acquaintance with the works of great teachers, statesmen, writers, artists, scientists and philosophers throughout the ages can build in the mind of the student a sense of values that will help him to make wise decisions.
>
> Education is a life-long task for every man.

The degree course for forestry in Britain is generally a three years' one. The student's time is very fully occupied during the University terms. Practical work in forestry is mainly carried out in the vacations.

Above. *Students practising notch-planting of spruce in North Wales.*

Below. *A laboratory class in forest botany at the University College of North Wales.*

By courtesy of British Information Service.

Each list of tenets might be considerably expanded. What is set forth will, however, serve to provide a foundation for discussing education in forestry.

General education

The educator in forestry must choose from the learned fields — literature, art, history, philosophy and religion — the type of educational material which will enable the student entering forestry to understand man and his aspirations, his hopes and fears, his longings and yearnings, his weakness and greatness, his kindness and wisdom. This would be an heroic task were it not that such subject matter underlies all education. The forester's need in these fields differs little in breadth from that of the basic education for statesman, writer, business man, public servant, clergyman, or teacher. Many schools of forestry require for admission demonstrated competence in such fields of general education. Too often this unfortunately means that, in the press of specialized study in forestry that follows, continued effort to widen and deepen general understanding may be neglected. The forester who misjudges his fellow man is doomed to failure no less serious than the one whose technical competence is inadequate.

The forestry educator may look to the generalist for help in determining the general education his students require. He himself, however, must determine the specialized knowledge needed.

Scope of the profession

The outsider might expect to find general agreement among foresters on the extent and character of specialized knowledge required for the practice of forestry. Such, however, is far from the case. The forestry profession is developing rapidly. Its activities are constantly being widened as new tasks which foresters alone are best fitted to perform are thrust upon them.

The debate among foresters centers on two questions: what is forestry, and what are foresters?

A formal definition of forestry is the science and art of forming, caring for or cultivating forests. Some interpret this as restricting forestry to the management of growing timber. Others maintain that forestry embraces the management of the forest land for all its products and services, including timber, and also water, wildlife, forage, and certain broad, human services such as soil protection and use for recreation. For example, the responsibilities of federal foresters in the United States were set forth by Secretary of Agriculture James Wilson in 1905 in his first directive to Chief Forester Pinchot. He used these words:

> " All the resources of forest reserves are for use, and this use must be brought about in a thoroughly prompt and business-like manner under such restrictions only as will insure the permanence of these resources. "

The directive mentions specifically wood, water and forage as products for use.

While forestry in theory deals primarily with trees as the chief biologic feature of the forest, the forest land manager must concern himself with all the land resources within the boundary of the forest it is his responsibility to manage. Therefore, the concept of the forester as a man concerned solely with growing timber, or more specifically growing trees on forest land, is now largely outdated, if, in fact, it ever had wide acceptance.

The forester has always been a land manager and where attempts have been made by either government or private landowners to restrict his activities specifically to trees, he has been ineffective in fulfilling his mission.

The forest land manager may sell his timber on the stump, his forage attached to the grass roots, and his water in the stream bed, and he may furthermore neglect the recreational value of his land and all minor forest products. If, however, he seeks to maximize the income from the land and hence the total of human satisfaction that may be derived from it, he may find it expedient to carry his responsibilities much farther. He may harvest timber and process it; he may manage herds of domestic animals; he may lease recreational privileges, including shooting rights. If multiple use is to be a basic feature of his land management program, the forester must have final control over all uses of the land, else he becomes, in fact, no land manager at all. Timber processing by the forester may include sawing lumber, manufacturing charcoal, preparing chipped wood for pulp mills, giving preservative treatments to fence post and poles, and manufacturing cross ties. Whether such timber processing is a part of forestry is largely an academic matter. The forest landowner is concerned with revenue from the land, and will hire the type of forester who can produce it.

This places on the forester the responsibility for making certain business judgments and decisions and for undertaking certain business operations to fulfill his mission as a land manager. He must be a man who can deal effectively in business terms with his superior. He must understand how to present his basic information, his conclusions, and his recommendations so that they can be readily understood and acted upon.

Breadth of education

Forests can be managed well only by one who understands the biologic nature of trees and of the other life that makes up the forest. In other words, a forester must have a basic understanding of living plants and their life requirements. He must be conversant with their basic mineral needs, their use of water, light, carbon dioxide, their growth responses to temperature, their genetic nature and capacity for variation, the other plants that compete with trees at the several stages in development from seedlings to mature trees, the insects and other animal life that feed upon trees and tree seed, and how the forest is affected by the vicissitudes of weather, and other natural forces.

The forester must have an understanding of soil, not solely as a source of moisture, mineral elements, and support for the tree, but also as a medium in which biologic activity is extremely intense. He should be cognizant of how organic materials are being built up and broken down; of the myriads of small animals that burrow through the soil feeding on roots and organic debris, maintaining tilth and aeration and providing channels for percolation of water. In the last analysis, the forester is really a manager of soil, and

it is his capacity to maintain the soil in optimum productive capacity that determines his success as a grower of forest crops.

Biologic activity is made up to a large extent of various physical and chemical transformations. In harvesting and using products from the forest, man relies largely on physical and chemical means. The forester, therefore, requires a basic understanding of mathematics, physics and chemistry and their application in land surveying, timber estimating, construction of roads and other improvements, timber harvesting and processing, and in the control of insects and fungi, in fire control, and in the biologic processes that are essential to the health and well-being of forests.

The forester needs to understand wood as the main product of the forest, its physical and chemical properties and above all its many uses. It is through conversion of wood into useful products that revenue is obtained to protect, cultivate and rebuild the forest. The forester must also understand the other products of the forest and their potential use and value, especially the forest wildlife, water, forage, and secondary plants and plant products.

The forester deals with the physical and biologic world, but his objectives are basically related to man. He must operate in a social environment and make effective use of social institutions. Marketing of forest products, transporting them, administration in forestry, forest policy, personnel management, wildlife management, watershed management and management of areas for recreational use — these, which draw heavily upon the social sciences for basic understanding, must become a part of the forester's working knowledge.

The educator in forestry builds his professional courses on basic knowledge by the students of biologic, physical and social sciences. His unique contribution is forestry science and practice. The individual courses cover the establishment, protection and care of forests, the management of timber and related resources, forest products and their processing, and the administration of a forestry enterprise. They also include forestry history and policy, and the economic significance of forestry and its place in the general economy. Individual courses and their content vary widely from school to school and country to country, yet the common pattern referred to is maintained.

Depth of knowledge

Few men can encompass in a comprehensive way all fields of knowledge upon which forestry depends. The forester as a land manager must, therefore, depend increasingly upon the services of research men and specialists in the several fields of forestry. The schools of forestry must educate research men as well as forest land managers. Forestry is one of those professions that has places for men of widely varying talents: for field forester and nurseryman, research man and teacher, planner and executive. It is a responsibility of forestry teachers to recognize talent in their students and to plan their program in such a way that the young men of superior ability become interested in those fields where their creative talent can be widely used. Education in forestry indeed would miss its goal if it did not provide for challenging each youth so that he becomes of maximum service to his profession. This is difficult to reconcile with fixed curricula. However, no forestry school can be serving to best advantage unless the potential leaders among its students are recognized and provided educational challenges proportionate to their abilities.

Education for the individual is a lifelong task in both his profession and in his duties as a father, a citizen, and a servant to his fellow man. The rapid advances in knowledge gained through research and administrative practice need to be quickly disseminated to all practitioners. Here the schools have another role to play. Up to date, this has been a major function of professional societies. The task is becoming increasingly complex and the talents of the educator need to be drawn upon to evaluate and communicate new ideas. Conferences, symposia, and short courses may be used to meet this need.

A forestry school becomes in time much more than a training center for aspiring foresters. The expert knowledge of its professors is drawn upon to aid practitioners, industry and government. Its research work makes it a center that attracts visitors from many lands. It is constantly in touch with faculties in related fields for exchange of knowledge and methods that promote science and resource management. Because of its knowledge of many men, it is called upon by recruitment officers. Above all, it serves to disseminate clear thinking on vast resource problems. Thus its constituency embraces land owners and managers, industrialists, legislators and governmental administrators. It is an agency for promoting understanding and good will among resource managers and users everywhere. It is an agency for prosperity and peace.

The ultimate measure of any forestry school will be the success it attains in educating men to high ideals and broad purposes that enable them to become national and world leaders in forestry. Many schools have met with success in this as their graduates have risen to such positions as congressmen and other legislative representatives, governors, heads of great corporations and even prime ministers. The need for schools of world wide competence has never been greater than it is today, because forestry is becoming increasingly international in scope. This but accentuates the importance of linking professional knowledge to a wide understanding of science, government and mankind.

Sawmilling in Sweden

by B. Thunell
Wood Technology Department, Forest Products Research Laboratory, Stockholm

Sweden produces some 1.5 million standards of sawn wood annually, over 64 percent being of export grades, and Swedish timber is firmly established on world markets. This country's experience in sawmill organization and practices is therefore of general interest.[1]

In Sweden, as elsewhere, the location of sawmills is determined by the facilities available for bringing logs from the forest and for transporting the sawn products to the market or shipping center. In the northern part of the country the large sawmills are usually situated near the coast, since logs can be conveniently floated down the rivers to the mills and the sawn products loaded almost directly onto ships. In southern and central Sweden, where most of the saw logs are transported by trucks, the sawmills tend to be located in the interior of the country near the source of timber supply rather than on the coast. It is more economical to transport sawn products than logs. Over a fairly short distance the costs of transporting by trucks and of floating are about the same, but as the distance increases, overland transport becomes proportionately much more expensive than water transport. The costs for different methods of transport are illustrated graphically in Figure 1.

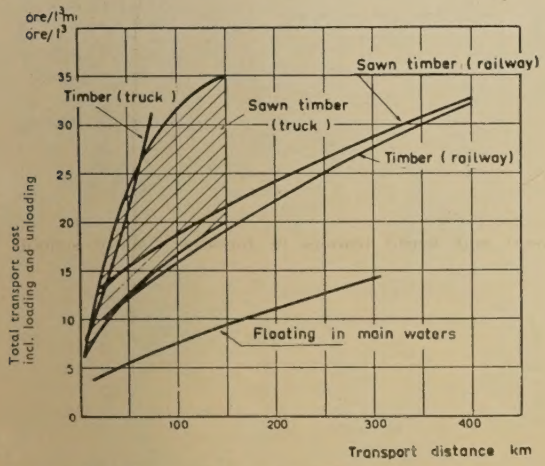


Figure 1. - *Expenses for transport of timber and saw logs with different methods of transport*

Transport considerations also affect the type of sawmill that is set up. Sawmills in Sweden are of two main types; frame-saw mills with one frame saw or one or more pairs of frame saws, and circular-saw mills with a single circular saw or with one or more sets of circular breaking-down saws, rip saws and edgers. It is estimated that the timber catch region for log frame mills having one pair of log frames must be about 3-5 times larger than the area for a complete circular-saw mill. This is because a frame mill must collect a sufficiently large stock of logs to permit the required number of logs of certain dimensions to be selected. Hence log transport distances are greater for frame mills than for circular mills, and, if water transport is not available, log transport costs will be much higher. This favors the establishment of circular-saw mills rather than frame mills.

Furthermore, as the annual output of a mill grows, the transport expenses rise. Hence, in determining the most suitable size of sawmill for a particular area, transport expenses have to be taken into consideration.

Sweden is a land with a large number of lakes and waterways. For this reason, logs are very often stored in water, particularly as this facilitates sorting and prevents fungal and insect attack. Special precautions may have to be taken against freezing in winter, but it is also common for sawmills to stockpile on land enough logs to keep the sawmill in operation through the winter, in which case they are protected from decay by spraying with water.

In most Swedish frame mills the operation of sorting logs according to size is carried out in water, the various sizes being guided into different storage ponds. A large volume of logs must be collected and stored because a sufficient supply of logs of any one dimension is needed to keep the mill going for one shift. This storage increases interest costs and the risk of deterioration of the logs during storage. Land sorting arrangements exist in Sweden and work fairly well, but it is not possible to sort so many dimensions simultaneously on land as it is in water.

With circular-saw mills, logs do not need to be sorted; in fact, a mixture of logs of different dimensions is an advantage.

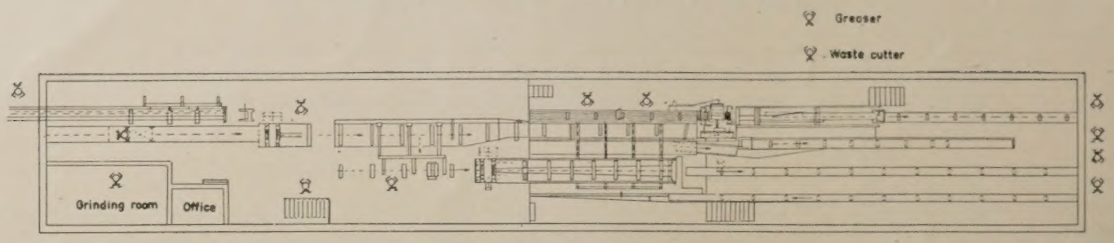
Frame-Saw Mills

The basic production line of a Swedish frame-saw mill consists of three main machines: the log-edging frame, the deal frame and the edger. These three machines are placed one behind the other (see Figure 2). The larger Swedish mills usually have several parallel production lines, of which each one, working single shifts, is capable of turning out about 5,350 standards of sawn timber a year.

The series of operations in this basic production line which consists of a single pair of frame saws is illustrated in Figure 3. The logs are barked and are then sorted according to size in the log pond. Logs of the same

[1] This article is a brief condensation of a much more detailed report compiled by Dr. Thunell in his capacity as chairman of an FAO working party on sawing and machining.

FIGURE 2. - *Sawmill with one pair of log frames. Scale 1:300*



size are hauled up into the mill on a log chain running in a trough. As each log is required, a log kicker rolls the log down into position in front of the log-edger frame where the sawyer, controlling an infeed carriage, sets the log straight and introduces it between the feed rolls of the saw.

The log is cut into a central billet, side boards and slabs. The billet is prevented by a device from going on further, while the side boards continue to the board edger. Waste slabs fall onto a waste conveyor. A lateral conveyor then brings the billet to the intake rolls of the deal frame and after adjustment the billet is introduced between the feed rolls and sawn up to the required dimensions. The interior parts give finished boards which proceed immediately to the sorting plant, while the unedged boards from the outside are separated and are conveyed to the board edger. Slabs fall onto the waste conveyor. Some examples of typical saw blade insertions used during these operations are given in Figure 4.

Modern log frames run at high speeds. Speeds between 320 and 370 strokes per minute are common, with a stroke length of 600 millimeters. An average feed speed is 25 millimeters per minute.

The board edger consists of two or more circular saws revolving on the same shaft. The distance between the saws is mechanically or hydraulically adjustable. The two-saw edger is the more common machine.

FIGURE 3. - *Production survey of a gang-saw mill according to B. Thunell.*

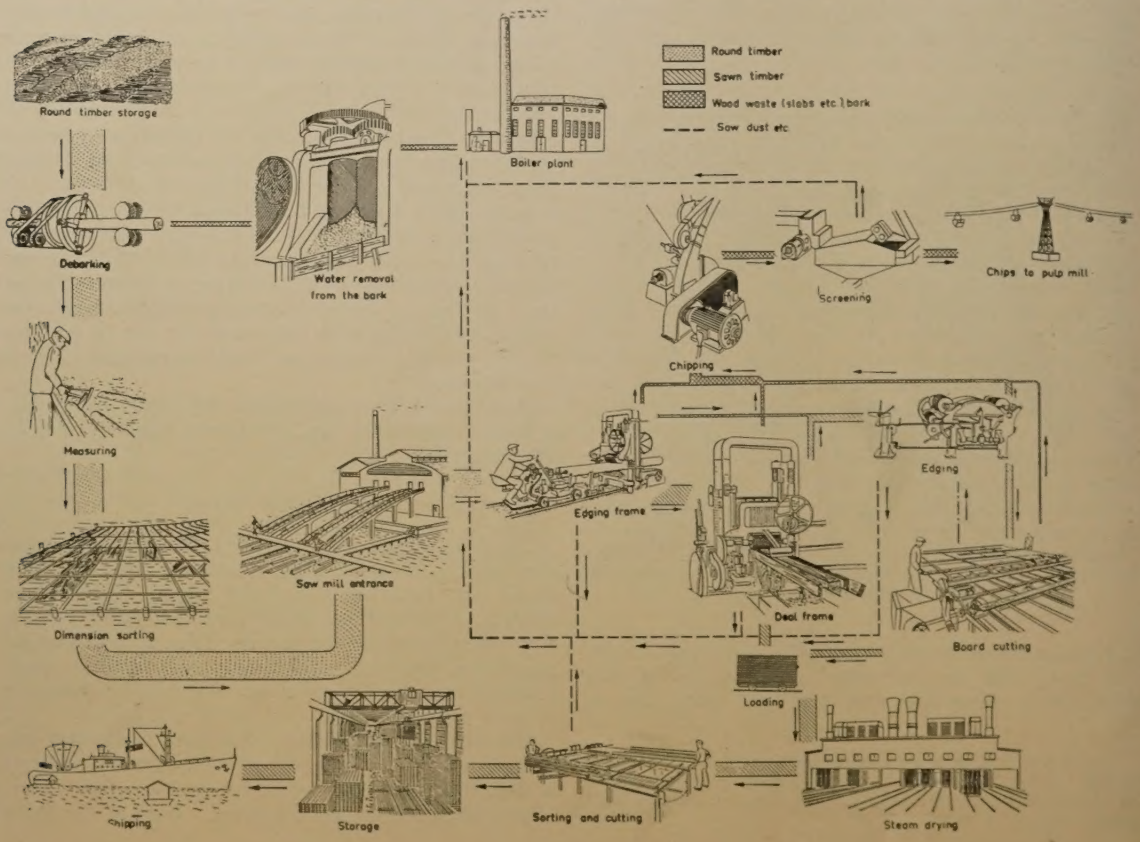
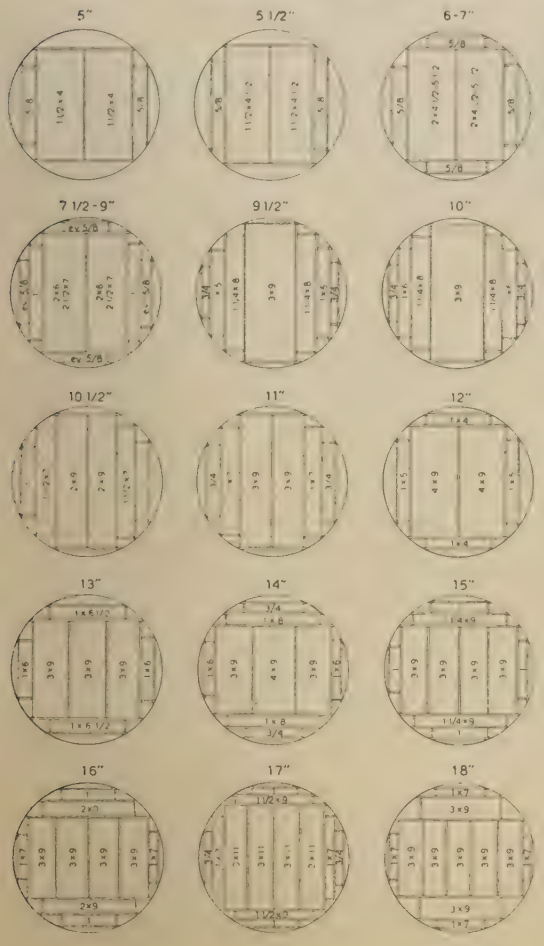


FIGURE 4. - *Examples of saw blade insertions.*



Larger sawmills simply consist of two or more production lines, similar to that described above, operating parallel to each other (see Figure 5). The advantage of having two or more lines working simultaneously is that logs of different sizes can be cut at the same time.

Some very small saw mills have only one log frame. Logs are edged on this frame in the morning and the billets returned on a special conveyor to the pond. In the afternoon the saw blades are changed and the billets are cut into boards on the same saw.

In all these types of mill, boards from the edger proceed to an end trimmer which generally consists of a cross conveyor feeding the boards towards a fixed trimming blade which cross-cuts one end. Before cutting, the boards are put in position by hand. Then rolls feed the boards to the other side of the conveyor where another saw trims the other end, the board lengths being fixed by a gauge on the table. The trimmed boards then proceed on the conveyor to a sorting table, often passing through an anti-blue-stain dip on the way.

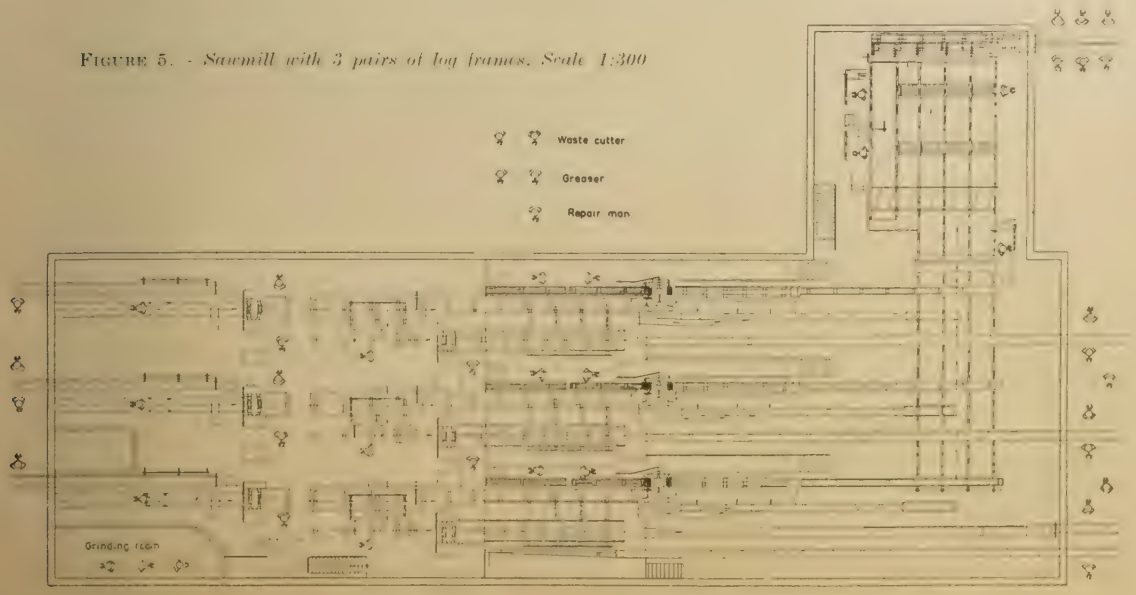
In smaller mills, sorting is often done by hand by the man who does the first trimming operation. In larger mills, mechanical sorting machines are common.

Waste slabs and offcuts are either cut into firewood lengths or into chips which are used in the paper, cellulose, and wallboard industry. Sawdust is removed by special conveyors.

After the sawn and trimmed lumber is dried, it is again end-trimmed ready for stacking in shipping bundles. A modern end-trimming machine trims the lumber at both ends to the required lengths, stamps the shipping-mark at each end, registers the number of planks of each length as well as the total number and stamps a figure at one end of the plank indicating its length.

The number of men employed in a mill with one pair of log frames is usually 14: one man at the log intake, 2 sawyers, 1 assistant sawyer, 2 edger operators,

FIGURE 5. - *Sawmill with 3 pairs of log frames. Scale 1:300*



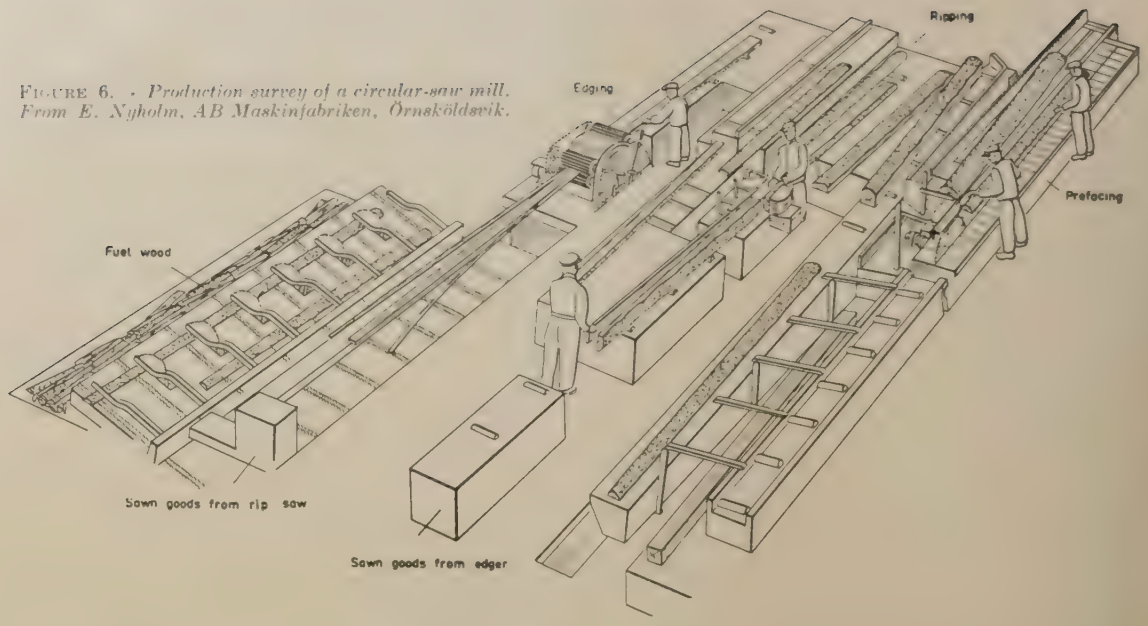


FIGURE 6. - *Production survey of a circular-saw mill. From E. Nyholm, AB Maskinfabriken, Örnsköldsvik.*

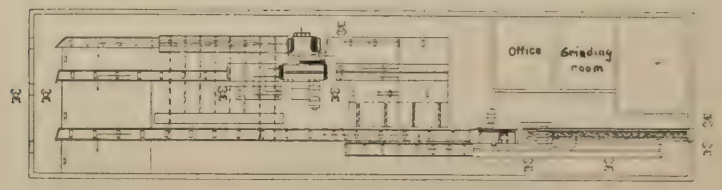
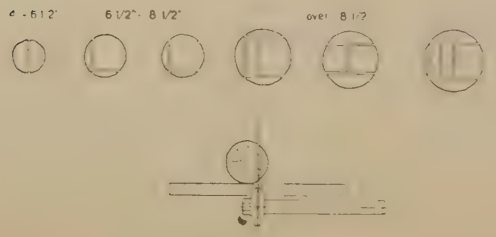


FIGURE 7. - *Sawmill with a circular-saw and ripsaw and edger (complete circular-saw mill). Scale 1:300.*



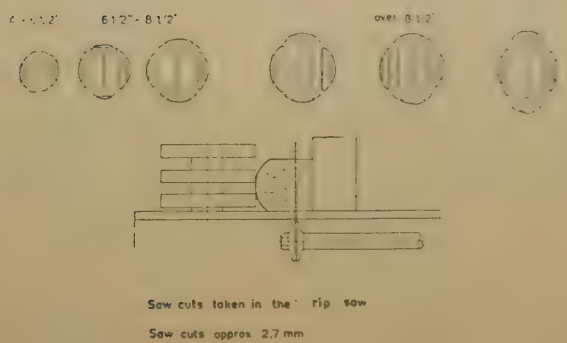


FIGURE 8. - *Saw cuts in complete circular-saw mills.*

FIGURE 9. - *Single circular-saw mill. Scale 1:300.*

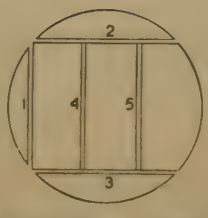


FIGURE 10. - *Saw cuts in a single circular-saw mill.*

4 sorters, 1 grinder, 1 greaser, 1 waste cutter and 1 spare man. The 8-hour capacity of such a mill is 17 standards. The number of men in a mill with two pairs of log frames is 30: 2 at the intake, 2 sawyers, 2 assistant sawyers, 2 edger operators, 2 assistant edger operators, 3 trimmers, 2 waste cutters, 2 grinders, 1 greaser, 1 repair man, 8 sorters and 3 spare men. This mill has a capacity of 35 standards per 8 hours. A sawmill with three pairs of log frames employs 49 men and has a capacity of 55 standards per 8 hours. These details do not include the men employed on the log pond or in the stacking yards and kilns.

Circular-Saw Mills

The complete circular-saw mill has three main machines, the breaking-down saw, the ripsaw and the edger (see Figures 6 and 7).

The blade of the breaking-down saw is mounted in a frame of wood or of welded steel. The log is laid in a table which runs on rollers, the table being driven either forwards or backwards by a feeding mechanism. After cutting a slab from the log, the thickness of the next cut is determined by pressing the sawn face against a laterally adjustable fence. The log is sawn on one, two or three sides in this machine according to its size (see Figure 8). The resulting billet is transferred to the ripsaw and the slabs either go to waste, or to the ripsaw for further treatment. At the ripsaw, which usually has power feed rollers, the billet is converted into boards. Finished boards proceed to the edger, if necessary, or, if not, directly to the stacking yard.

Waste from the three machines is conveyed under the floor to the point at which it is to be cross-cut into firewood. Waste from circular mills is rarely converted into chips. Either multiple-saw cross-cuts or single-saw swing cross-cuts are used for waste. The boards are usually trimmed with a swing cross-cut saw.

Simpler circular-saw mills exist in Sweden. Some have only a breaking-down saw (Figure 9), and cuts are made as shown in Figure 10, while others have an edger as well. Some large circular-saw mills have two breaking-down saws, two ripsaws and edger. Nine men are usually required for the standard mill with three machines: 2 log rollers, 2 breaking-down sawyers, 2 ripsaw men, 1 edger operator, 1 cross-cut operator, 1 sorter. Their capacity in an 8-hour day is usually about 6.5 standards.

Consumption of Raw Material

In operating a sawmill the most effective use of the raw material is of the utmost importance. For the same log input volume the various sawing methods give different sawn output yields. This is due to different saw blade design, sawing precision and other factors.

The difference in yield is particularly apparent between log frame and circular sawing. The fixed positions and thinner blades of the frame saw result in greater precision and less waste than with the circular saw.

Table 1. – Proportions of Yield and Waste from Various Methods of Sawing

	Frame mill	Complete circular	Single circular
	..... *Percentage*		
Sawn wood	54	50	44
Chips for pulp	29		
Sawdust	11	13	19
Trimmings	3		
Slabs, edgings and trimmings	—	34	34
Shrinkage allowance	3	3	3

Losses owing to lack of precision in sawing will be additional, and these will probably be greater in timber sawn by circular saws than in log frames, although more modern circular sawing machines are obtaining greater precision.

Log frame sawing amounts to a mass production process in which each log is sawn with the blade positions fixed, and the sawyer merely rotates the logs to the most convenient position. In the circular saw mill, on the other hand, the sawyer can make the cut according to the peculiarities of the particular log he is handling. Results are, therefore, much more dependent on the skill of the sawyer with a circular saw than with a log frame. Canadian and Norwegian experience confirms that a skilled circular sawyer can obtain cuts with a circular saw that are just as accurate as those obtainable with a log frame. This ideal, however, is rarely achieved.

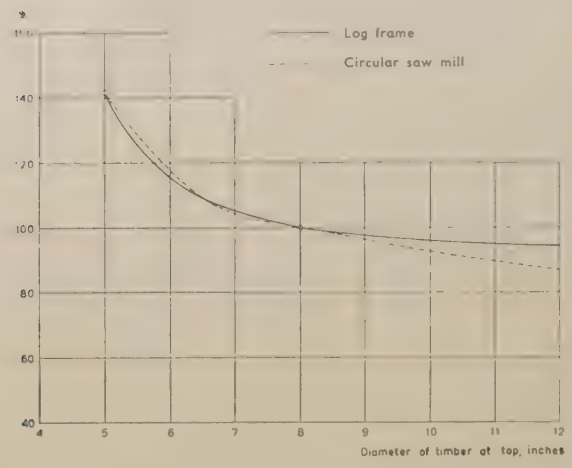
The circular-saw mill can deliver special assortments of lumber without difficulty. This would be impossible for large frame mills without a considerable rise in prices. Small circular-saw mills are most useful in supplying the home market with these mixed parcels of sawn wood. Sawn wood produced by circular saws generally fetches lower prices than the output of frame saws but the difference is very slight in times of great demand.

Log and sawn wood dimensions

Throughout most of Sweden, logs have an average length of 15 feet (4.5 m.) with a diameter at the top of 8 inches (20 cm.), and these are the measurements assumed in the calculations given so far. In some regions, however, particularly in the southern parts of Sweden, these dimensions are not representative. Many sawmills in the highlands of Småland are obliged to cut logs 12 to 13 feet (3.7 to 4 m.) long with an average top diameter of 6 to 7 inches (15 to 18 cm.).

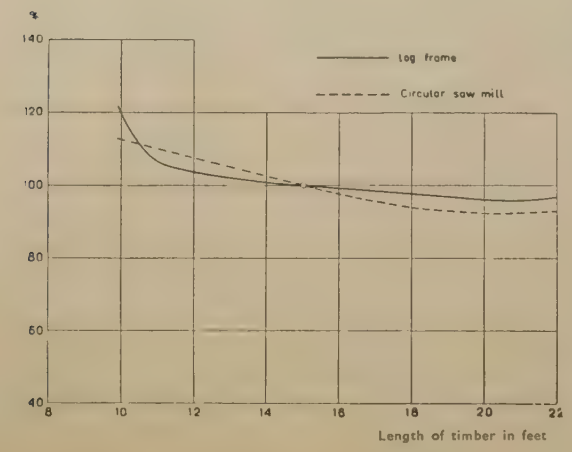
Although conditions vary from one sawmill to another, as a general rule the output of sawn wood will fall and expenses will rise considerably when the log size is reduced (see Figures 11 and 12). The length of the logs has a greater influence when sawing with a circular than with a frame saw. This is due to the fact that the feeding in and return of the logs consumes a greater proportion of the working time in circular sawing than

FIGURE 11. - *Example of the alteration in the total cost when sawing different dimensions for the sawing method concerned, per standard, 8" log = 100 percent, log length 15'.*



it does in frame sawing. In a log frame it is almost possible to saw with the logs end to end, so that very little time (not more than about 5 percent) is wasted.

FIGURE 12. - *Example of the alteration in total cost when sawing different log lengths for the sawing method concerned. Log length 15' = 100 percent, 8" log.*



Waste utilization

The cost of the various methods of sawing depends very largely on the use made of waste in the sawmill. This is no longer a problem in the large sawmills in the northern part of Sweden where, with the exception of off-cuts, all the waste is utilized. The sawdust is used as fuel and the edgings and slabs are cut into chips for the manufacture of pulp or wallboard.

To allow slabs and edgings to be used in this way, the logs must be barked. Barking machines are expensive to install and are, therefore, suitable only for large sawmills. When such machines are used, presses are usually installed to reduce the moisture content of the bark to about 55 percent so that it may be used as fuel. It has been found that, provided sawing is continuous over the greater part of the year and the capacity between 2,000 and 2,500 standards, a mill with one pair of frames is the smallest in which it is economically practicable to install debarking equipment.

The installation of a chipper, on the other hand, is economically justified in a sawmill with an output of only 500 standards, provided the barking problem can be solved.

A step towards the solution of this problem is found in the semi-portable machines which operate at the stockpiles, no use being made of the bark. Tests are now being carried out to find some method of debarking slabs and edgings profitably which, if successful, may open up new developments.

Pulp mills buy up edgings and slabs in bulk and often arrange for transport as well. There is little demand in Sweden for slabs and waste as domestic fuel and the local market for wood charcoal has so declined in recent years that most sawmills have given up making charcoal from wood waste.

COST COMPARISONS BETWEEN DIFFERENT TYPES OF MILL

In the following comparison of the production costs of the various types of sawmill found in Sweden, all the mills are, for example, assumed to be of modern design. Their output capacity is based on 280 working days per year, although annual working time varies from 150 to 287 days. The average measurements of sawlogs are as already mentioned. The wood is assumed air-dried in open timber yards. In the timber yards of complete circular-saw mills and mills having one or two frame saws, truck transport is assumed to be by truck; also bridge-cranes are assumed to be available in mills having four or six frame saws.

Costs are based on the 1947-1948 levels (today's costs are about 50 percent higher) and are adjusted for known deviations. Average earnings are taken to be 2.30 Swedish crowns (U.S. $0.44) per hour, vacation allowance included.

In estimating depreciation, 3 percent interest on the capital and 1.5 percent interest for insurance, etc., have been added to the depreciation percentage. The time of depreciation has been estimated to be 5 years for a single circular-saw mill, 8 years for complete circular-saw mills, and 15 years for frame-saw mills. Erection costs for timber yards in complete circular-saw mills are estimated to vary in relation to yearly output. The cost of private dwellings, housing estates for workers, etc., have not been included. The costs of electric power per standard are low in Sweden, but frame mills require more power than circular-saw mills owing to their greater mechanization.

Figure 13 shows how output varies in different types of mills and Figure 14 shows the working hours per standard for these mills. Figure 15 illustrates how the running costs per standard of sawn output vary with the yearly sawn output in different types of mill.

A comparison of production costs, taking into account the use of waste, is made in Figure 16. The distance

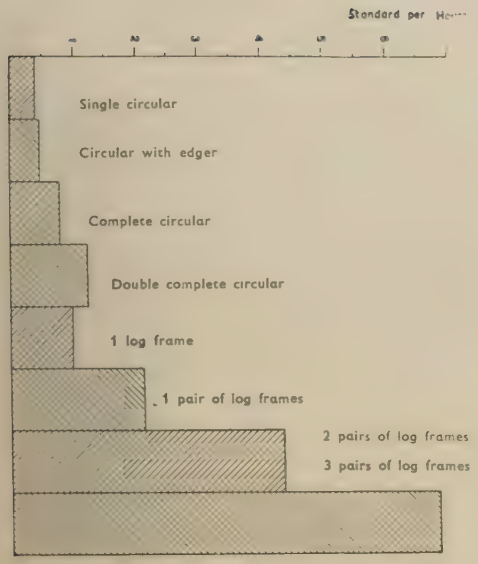


FIGURE 13. - *Output in standards per hour for different types of sawmills.*

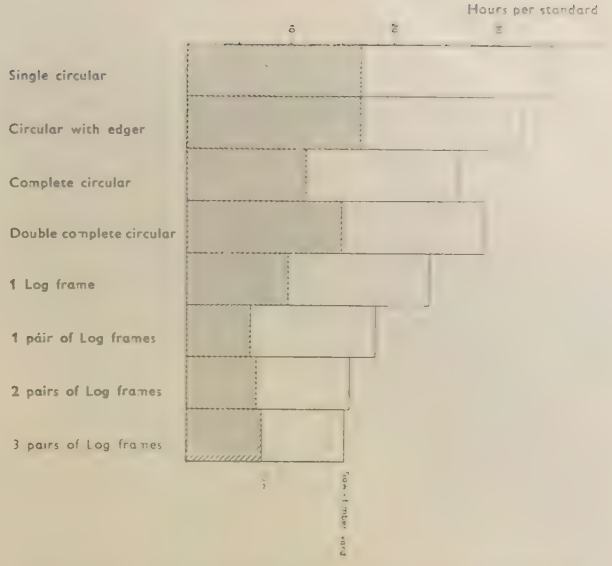
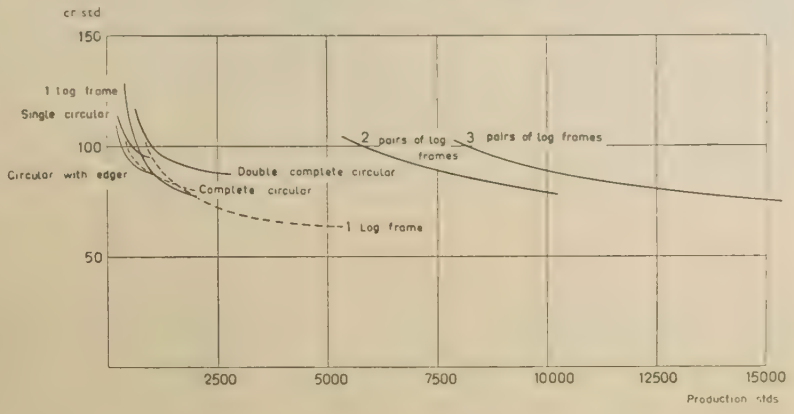


FIGURE 14. - *Working hours per standard for different types of sawmills.*

FIGURE 15. - *Comparison of output costs at sawmills of different types. (Expenses for labor of saw and in timber yard as well as for end-trimming and depreciations, including expenses for raw material and administration and certain general expenses.)*



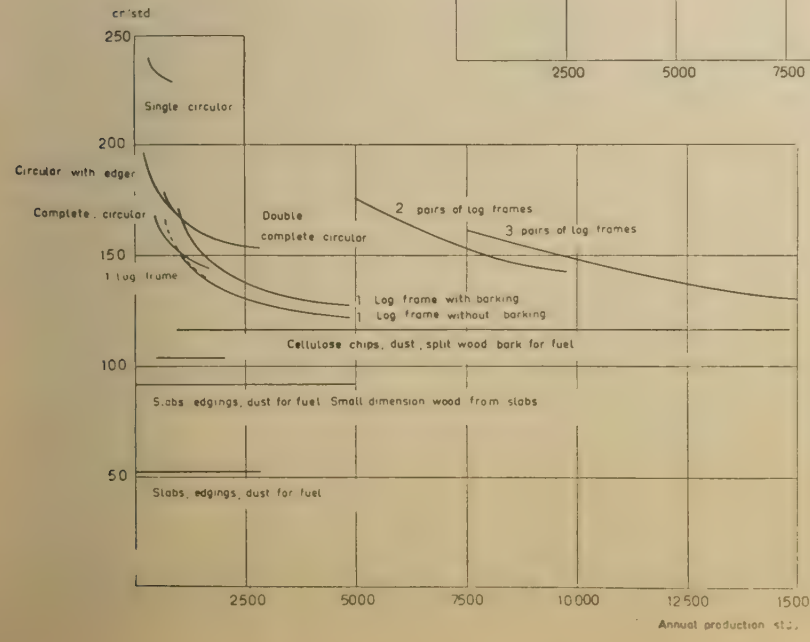


FIGURE 16. - *Comparison of production costs exclusive of material in sawmills of different types with regard to external and internal factors and the value of the waste.*

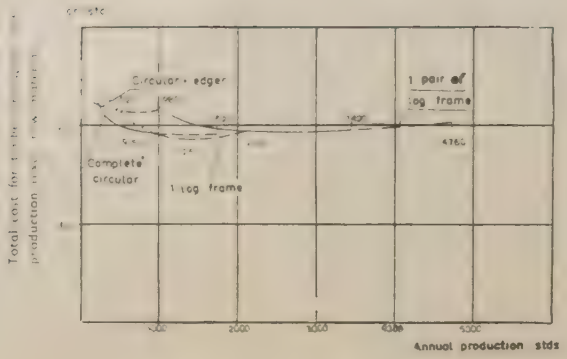


FIGURE 17. - *Total cost.*

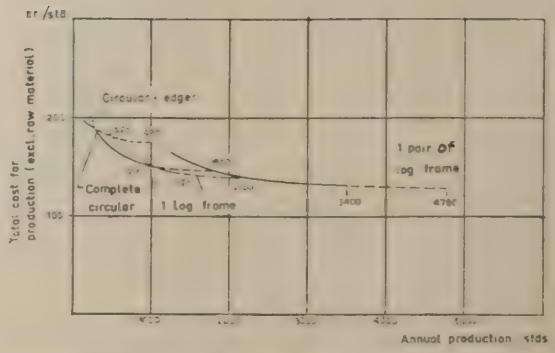


FIGURE 18. - *Minimum sawing costs (production costs excl. raw material) for varying annual outputs.*

between the curves and a particular waste line is a measure of the net costs. The minimum sawing cost for varying annual outputs in different types of mill is illustrated by Figure 17.

To assess the total cost for transport of timber and sawing, the values from Figure 17 are added to the cost of the timber transport. The cost, as calculated in this way, is shown in Figure 18.

The figures reveal that there is remarkably little difference in expenses between the different sizes of mills; the advantages of mass transport by floating are, however, apparent.

An essential condition for the erection of a large sawmill where floating transport is not possible is that there should be an adequate highway system. This is not often the case in many extensively forested areas.

For various output volumes, the type of mill which would operate with the lowest production costs in Sweden is shown below:

TABLE 2. – TYPE OF MILL OPERATING WITH LOWEST PRODUCTION COSTS

Output (in standards)	Type of mill
0 – 50	single circular
50 – 200	circular with edger
200 – 975	complete circular
975 and above	log frame

1. - *Timber comes floating down a Swedish river on its way toward the sea.*

2. - *Logs stopped for sorting in Swedish coastal waters: each log carries the owner's mark.*

Avalanche and Torrent Control in the Spanish Pyrenees

by FAO Staff

In May 1955, foresters of the Sixth Division of Forest Hydrology of the *Patrimonio Forestal del Estado* (National Forests Organization) were hosts to foresters of the Alps and Pyrenees Divisions of the *Direction des Eaux et Forêts* (Directorate of Waters and Forests) who had come to see avalanche and torrent control work in a segment of the Spanish Pyrenees. A staff member of the Forestry Division of the Food and Agriculture Organization was invited to accompany the party.

At Canfranc near the French-Spanish frontier, where the Spanish railway system joins that of France, are marshalling yards and a railway station called the *Estación Internacional*. The station is in a deep valley surrounded by steep, rocky mountains and is annually threatened by avalanches. To protect the railroad installations, the Spanish foresters are constantly working to prevent the occurrence of avalanches. The lower slopes of the mountains were virtually denuded of forest cover prior to the initiation of this work 50 years ago but have since been almost entirely recovered with *Pinus sylvestris*, *P. montana*, *Larix europea* and several species of *Populus*. Higher on the mountains engineering structures have been sited, designed to contain or to break up avalanches before they reach the valley.

The most troublesome path of avalanches in this area, *Torrente Estiviellas*, begins at an elevation of 2,500 meters in a zone of bare granitic rock, having little or no cover of trees or other vegetation and where snow accumulates 12 meters deep during the winter. Slopes of greater than 100 percent are common. The engineering works in this *torrente* are designed either to prevent the snow from starting to move; or to stop

Figure 1. - *Timber snow-bridge.*

Figure 2. - *Side view of the concrete snow-bridge.*

Figure 3. - *Concrete snow-bridge seen from above.*

FIGURE 4. - *Structures built on the slopes overlooking the railroad at Canfranc.*

In another area visited, the facilities of a tourist resort are under constant threat from avalanches. At the present time, this resort is used only during the summer months but it is hoped to develop it as a winter sports center, and considerable work is being planned to protect the facilities. The impressive thing about the whole project is the enormous amount of background engineering work which has gone into the planning phase. Extremely detailed maps have been drawn up showing contours, areas of greatest avalanche danger, types of structures which seem to be suited for particular conditions, placement of these structures, availability of structural materials for them and their costs of construction. The planning work for the entire basin from which avalanches threaten has been completed before construction work has been started.

avalanches which have already begun their descent; or to break up the avalanche by disintegrating it.

For the first purpose banquettes, wire nets or chains, poles of wood and iron and recently the so-called "snow bridges" have been built. The snow bridge, which is known as *râtelier* in Switzerland, is made of timber (Figure 1) and reinforced concrete (see Figures 2 and 3).

To stop avalanches which have already begun, large masonry dikes are used. These "hollow dikes," as they are called, have a large opening in the lower part to prevent waters from above from filling up the space behind the dike with solid debris. They are placed in strategic positions where the natural slopes will take the direct impact of an avalanche and reduce the force with which it subsequently falls on a dike.

The more modern structures tend to break up and disperse the avalanches so that the smaller fractions can be held by trees planted lower down on the slope. They may be either hollow dikes topped by a line of arches across which the avalanche passes and is broken up, or structures made of masonry piers bridged in between by logs. Use of such structures (Figure 4) to hold back avalanches which have already begun to move is a new feature and has not been tried out in any other constructions. The idea originated when it was noticed that an avalanche had been stopped in its descent down the mountain by two enormous pine trunks lying in a gorge in its path. Logs were first used only experimentally because it was thought that the impact of snow and rocks would easily break them, requiring constant replacement. However, they have given satisfactory service so far and make this kind of structure much less costly than those made entirely of masonry or concrete.

No avalanches have reached the railroad installations since work was begun in this area, but the Spanish foresters emphasized that, to justify work of this character, the values being protected must be very high. Other parts of the Pyrenees are equally prone to avalanches but the low value of these localities does not give claim to structural protection. Instead, the people in the valleys must move to other areas in winter.

Torrent control

Torrent control is also a great problem to the forester but as in the case of avalanche control, the values to be protected below a torrent must be high to justify the very considerable costs involved.

In the mountains near the town of Biescas is a tremendous project of torrent control. It is in a drainage area where entire hillsides are sloughing away, causing tremendous volumes of silt and rock to be deposited in the streams below. The justification for this project is the prevention of excessive siltation of hydro-electric developments in the river below and to protect the only road into the large main valley. The headwaters rise from loose, granitic soils, highly erosive, on steep slopes. Above the main works there are 12,000 hectares of watershed.

There are three small villages in the watershed containing a total of thirty families, each family owning about 20 hectares of cultivated land. Approximately 1,000 head of sheep and 1,000 head of cattle graze on the watershed during the snow-free period. The sheep are trailed to lower country during the winter but the cattle are fed hay in the villages. These villages may ultimately have to be purchased as a protection measure under the scheme referred to later. In the meantime, in the immediate area of the landslides, a series of six or eight masonry dams have been constructed across the torrent (Figure 5), connected by large rock walls which prevent the soil which slips down the steep slopes from entering the stream. Even so, erosion rates are so severe that one of these dams has been completely filled with silt and debris in one year. When the dams cease to function as such, they form instead a series of steps over which the water passes.

The entire torrent course from the point of these structures to the valley below, a distance of 1.5 to 2 kilometers, is confined by such a series of masonry steps and walls. They reduce the velocity of the water and absolutely control its movements, but full control of this torrent has not yet been achieved. A tremendous effort has been made to establish trees on the areas where erosion is active, *Populus* sp., *Salix* sp., and *Pinus sylvestris* being used for this purpose.

On the other side of the valley is another landslide which has been largely controlled by a series of rock walls built across the slide and by the planting of trees in the spaces between. The torrent is channelled down a long series of masonry steps and carried beyond the fertile, irrigated farmland in the valley so that the danger of flooding is greatly reduced.

The soils of the Pyrenees appear to be highly unstable and this, coupled with runoff rates from snowmelt and torrential summer storms, results in widescale erosion. Tremendous volumes of silt, rock and other debris have been deposited in huge alluvial fans at the mouths of the small drainages.

Cultivation of so-called farm lands in the mountain areas has also contributed greatly to the high rates of erosion. Now, in order to gain better control of the mountain watersheds, the *Patrimonio* is undertaking a land purchase program. In some cases, the Forest Service is buying entire small villages along with the lands belonging to the villages and settling the people on irrigated farms being developed in the valleys of the main rivers of Spain. Villagers are not forced to sell their lands and many times tradition and years of family occupancy make them reluctant to settle elsewhere. The final persuasion is usually the relatively high prices which can sometimes be paid for these lands. The Government feels justified in this because purchase gives the foresters control of key areas on the watersheds for carrying out improvement programs while the villagers receive sufficient capital to begin operations on their new irrigated farms. It is the policy of the Government to increase agricultural production through the development of as much irrigated land as possible.

On one watershed area the Government has purchased seven villages and the surrounding land, an active program of tree planting and testing of adapted grasses is being carried out. Laborers who are doing the work are permitted to live with their families in the villages and are allowed to cultivate the small fields nearby which are judged suitable for this use. Incidentally, one of the Uniform Mediterranean Nurseries for testing forage plants, initiated by the FAO Working Party on Mediterranean Pasture and Fodder Development is established here by the Spanish foresters who, as a matter of fact, have established plots for growing seed of certain grasses and legumes which are useful both for grazing and rehabilitation of forest land.

Because of the high rates of siltation and the torrential nature of the runoff from the mountain watersheds, floods in the lower streams and rivers are often destructive and present serious control problems. To assist control, Spain has a law which assigns to the State all lands on the banks of the rivers which are subject to flood, unless other ownership can be proved. Even in cases where right of ownership can be established, the State has the power to plant trees on the banks of the river although the land owner is entitled to receive 40 percent of the income from the trees. This law appears to be a very useful weapon for the forester in getting more trees established along streams and obtaining better control of waters in the stream. In addition, some low masonry walls or other types of barriers may be built out from one bank of the stream to divert the water away from roads or other public works being threatened.

Watershed management

Altogether, Spanish foresters have an excellent [illegible] ciation of the problems existing on the [illegible] tersh[illegible] of their country and they are working hard to s[illegible] those problems. Although most of these [illegible] had a strong engineering training, they rea[illegible] it is not possible or desirable to apply [illegible] methods to all the problems of land, water, a[illegible] management. They are well aware that a good [illegible] of trees and other vegetation is essential to control soil erosion and excessive runoff of snowmelt and rain fall. Because of this, Spain is planting new forests at a rate faster than any other country in Europe. Spanish foresters are preparing to plant grass on lands where it has been destroyed, they are attempting to withdraw from cultivation those lands not suited to such use, and they are planning a program of forest range improvement through reduced stocking and other good management practices. They recognize that watershed management involves sound farming and range management practices as well as forestry and engineering.

FIGURE 5. - *Masonry dams for torrent control near Biescas. Poplar planting is shown in the foreground.*

At The Half-century Mark

by Richard E. McArdle
Chief, United States Forest Service

The year 1955 marks the fiftieth anniversary of the establishment of the United States Forest Service. This is, therefore, a good time to review the past half century of progress in forestry in the United States, and to take a new look at the tasks still ahead.

When the land that is now the United States was first settled large parts of it were covered by forests. Nearly all the land east of the Great Plains was unbroken woodland. Vast areas of forest also were found in the mountainous parts of the West. Trees were in the way of towns and farms and homes. Wood was plentiful; timber values were extremely low. The forests were used lavishly, or cleared away wastefully over large areas.

Fifty years ago, forestry in the United States was still largely a theoretical concept in the minds of a few forward-looking individuals; it had been given only a very limited trial here and there on the ground. Most people still believed the forests to be inexhaustible. Few forest owners had ever thought of holding and managing woodlands for permanent production. "Cut-out and get-out" was the nearly universal practice. Only a few men and women foresaw the day when the timber land of an expanding nation would be one of its vitally important resources.

The Forest Service came into being in 1905. Although, for some years earlier, the Federal Government had engaged in a limited amount of forestry work, it was not until the Forest Service was created that a broad national policy of forest conservation was developed and American forestry really began to make headway. Practically all of the major accomplishments in American forestry have occurred during the past half century — within the lifetime of many who are still active in forestry work.

The scope of the Forest Service

The work of the Forest Service has gone forward along three principal lines: forest research; administration of the national forests; and co-operation in forestry programs with the States and private owners.

Study of forests and forestry methods was the principal activity of the small forestry agency that preceded the Forest Service in the United States Department of Agriculture. Research work was greatly expanded after the Forest Service was created. In 1908, the Forest Service began to operate its first forest experiment station — the Fort Valley Station on the Coconino Plateau in Arizona. Other experimental forests and ranges were soon established. Pioneering research at these stations and elsewhere produced much knowledge to aid the advancement of fire control, timber management, range management, and watershed management. The Forest Products Laboratory, established in co-operation with the University of Wisconsin in 1910, began almost immediately to produce results of value to lumber manufacturers, wood processors, and consumers.

In the McSweeney-McNary Act of 1928, Congress provided a broad charter for a forest research program in the United States. Under the provisions of this Act, the Forest Service continued to establish regional forest and range experiment stations to serve the principal forest regions of the country. Today, the Forest Service maintains a forest products laboratory and nine regional experiment stations in the United States with numerous experimental forests, range, and watershed field centers. There are also forest research units in Puerto Rico and Alaska. Several of the forest experiment stations maintain their main headquarters or branch offices in co-operation with State or private universities and are housed on their campuses. State and private agencies and forest industries also conduct forest research; the Forest Service co-operates with them in many research projects.

National forests

The first national forests were established by reservation of certain areas of public domain, mostly in the western States. Later, Congress authorized government purchase of lands for national forest purposes, and additional national forests were established in the eastern part of the country. At first, the national forests were opposed by many who thought that these public forests were to be locked up, thus thwarting the development of local industry and sacrificing the present to the future. But the Forest Service adopted the policy that forestry is the preservation of the forests by *wise use*, that all land in the national forests was to be devoted to its most productive use, "for the permanent good of the whole people."

In 1905, the national forests were largely undeveloped, remote back-country areas. There were few roads and other facilities for protection and management. Today, these forests are playing an important part in the nation's economy. There are 150 national forests located in 39 States and in Alaska and Puerto Rico. Their combined area is more than 181 million acres (73,250,700 ha.). They are now supplying a yearly cut of 6,000 million board feet (27,180,000 m^3) of timber. As more roads are built into areas now inaccessible and as the basic growing stocks are further built up, the sustained annual harvest can be further increased. The national forests also are contributing to the nation's

livestock production by furnishing seasonal grazing for more than 8 million cattle and sheep. Last year, the national forests reported 40 million visits by persons seeking outdoor recreation. The Forest Service has developed some 4,500 camping and picnicking areas, and 200 winter sports areas. These forests are the home for great numbers of wildlife, including nearly a third of the nation's big-game animals. They have 81,000 miles (130,350 km.) of fishing streams and more than 2.5 million acres (1,011,750 ha.) of lakes.

National forests cover parts of the headwater areas of many of the nation's major streams. They are located mainly in the high-altitude areas along the mountain chains — areas that receive the most precipitation. These forests help protect the water supplies of some 1,800 cities and towns, of more than 13 million acres (5,261,000 ha.) of irrigated farm land, of more than 600 hydro-electric power plants, and of thousands of industrial plants.

As public properties containing basic natural resources, the national forests are managed for continuous production. A policy of multiple-purpose management is followed which seeks to maintain a balanced use of all the forest resources, and to bring the largest total of returns and benefits in the public interest.

Co-operative projects

Since in the United States the bulk of the commercial forest lands are in private ownership, protection and good management of these privately owned forests is of great importance to the national economy. The Forest Service has endeavored to meet its responsibilities in this field through a number of programs carried on in co-operation with the States.

The Forest Service co-operates with State forestry agencies to provide protection of State and private forest lands from fire. It also co-operates with the States in producing and distributing tree seedlings at low cost for planting on private lands. Another co-operative program provides technical information and advice to owners of forest lands and to processors of primary forest products. A number of co-operative projects are under way to combat outbreaks of forest insects and diseases. Federal and State extension services are carrying on a program of forestry educational work with farmers.

During the past fifty years most of the individual States have developed forestry departments. Today, nearly all of the 48 States, as well as Hawaii and Puerto Rico, are conducting forestry programs. With federal co-operation, the States have extended organized protection against fire to more than 374 million acres (151,359,000 ha.) of State and private forest and watershed land. In 1953, State protection forces held the area burned to be only 0.7 percent of the area protected. Of the 53 million acres (21,450,000 ha.) that still lacked organized protection, fires burned 13.5 percent.

State forest nurseries in 1954 distributed 465 million trees for planting on private lands. Technical assistance was given to 32,224 owners of forest land, whose total holdings amounted to 2,558,000 acres (1,035,000 ha.). States, counties, and municipalities maintain about 26.5 million acres (10,724,000 ha.) of State and community forests and parks.

Privately-owned forests

The past fifty years have brought notable advances in private forestry in the United States. Today, large numbers of owners are managing their forests for continuous crops of timber. Many of the big lumber and pulp and paper companies now employ their own forestry technicians to aid them in developing sound forest management practices. A number of private companies and forest industry associations also distribute free seedlings and give forestry advice and assistance to small owners.

On the smaller private holding, forestry has not made as much progress. About 4.25 million persons are owners of small woodland tracts. Three of every four of these are farmers. The small holdings, farm and non-farm, comprise three-quarters of all the privately-owned commercial forest land in the United States. Continued educational efforts and assistance by the Forest Service, the State forestry departments, the forest industries, and private conservation associations have helped to give impetus to the application of forestry management to some of these small woodlands. But, on many more, forestry measures are not yet being applied.

Training foresters

Half a century ago, there were in the United States only a few dozen men with professional training in forestry. Not until 1898 had any American college offered a full course of professional training in the subject. Cornell University was the first to offer such a course. The Forest School at Yale University was established in 1900.

Today, more than 30 universities and colleges in the United States are giving full professional instruction in forestry. More than 21,000 students have completed regular four-year courses in forestry in the past 50 years. More than 4,000 have earned Master's or Doctor's degrees in forestry.

The Forest Service was the principal employer of professionally trained foresters in the first two decades of this century. In 1912, about 60 percent of the professional foresters in the United States were in Federal government work, and it was estimated that fully 95 percent had been so engaged at one time or another. The Forest Service is still the largest single employer of trained foresters, but it now employs only a part of the total. The States, municipalities, educational institutions, trade associations, and private corporations also employ large numbers of graduating foresters. Forest industries now employ nearly 6,000.

Foundation of American forestry

Whereas forestry in Europe evolved over a period of centuries, American forestry started little more than half a century ago with almost no background of technical knowledge.

European forestry contributed a great deal to the early development of forestry in America. When, in 1876, Congress made a small appropriation for the appointment of a man to study and report on the forest situation in the United States, one of his assignments was to ascertain " the measures that have been success-

fully applied in foreign countries ... for the preservation and restoration or planting of forests." The man appointed, Dr. Franklin B. Hough, went to Europe a few years later and made a study of forestry in the continental countries. His third report, submitted to Congress in 1882, covered the results of that study. The small Division of Forestry that preceded the Forest Service in the Department of Agriculture had as its chief for many years a European-trained forester, Dr. B. E. Fernow, a native of Prussia. Dr. Fernow served in this position from 1886 to 1898, when he became head of the first American forestry school at Cornell. In 1903, he became Dean of the Faculty of Forestry at the University of Toronto in Canada.

Gifford Pinchot, who became the first Chief of the Forest Service when it was established in 1905, obtained his forestry training in France, Germany and Switzerland. Henry S. Graves, who succeeded Mr. Pinchot in 1910, also studied forestry in Europe. For some years prior to and subsequent to his period as Chief of the Forest Service, Dr. Graves was Dean of the Yale Forestry School.

But European forestry could not supply ready-made answers to America's forest problems. In the western hemisphere the trees were different, soils and climate were different, the economic background and the attitude of the people toward their forests were different. There were hundreds of commercial species and scores and scores of forest types for which no information was available in the existing scientific literature of forestry. In the western United States numerous inter-related range forage types brought new problems involving forest grazing and wildlife uses. It was necessary for American forestry to build its own foundation of technical knowledge.

Contribution to world forestry

Considering that it had to start almost from the beginning, the progress made in American forestry during the past fifty years is most encouraging. Half a century of research and experience has provided many sound guidelines for good forest and range management in the United States. Forestry has become an actual on-the-ground practice on many millions of acres of public and private land.

It is particularly gratifying that in recent years, American forestry has been able to contribute something to the advancement of forestry in other parts of the world. American foresters had a part in bringing forestry into the program of the United Nations Food and Agriculture Organization. The late Henry S. Graves, the Dean Emeritus of the School of Forestry, Yale University, was chairman of the Technical Committee on Forestry and Primary Forest Products that defined the objectives and suggested the structure of a permanent international forestry organization. FAO had its Headquarters in the United States until 1951, when it moved to Rome. A number of American foresters, including former members of the Forest Service, have served or are now serving on the staff of the Forestry Division of FAO at its Headquarters or on its Technical Assistance missions to member countries. American forestry specialists also have served in the United States Point Four program, in response to requests for technical assistance from various countries.

The United States has been host to many visitors from other countries who came here to observe American forestry activities. The Forest Service, forest industries, forestry schools, and other agencies have co-operated in arranging tours and providing courses of study for our foreign visitors.

It is very much to be hoped that such foreign assignments for American foresters and aid to foreign visitors to the United States are substantially helping the forestry programs of other countries. It is certain that the exchange of information and development of better understanding that results from such international co-operation is of benefit to forestry in the States.

The next fifty years

Remarkable as has been the advance of forestry in the United States in the past fifty years, only a beginning has been made. There is still a long way to go in developing and properly using forest and range resources. Good forest management needs to be extended to many more millions of acres. There are large areas of depleted land that need to be made more productive. Through research and experience answers must be found to many problems in timber growing, watershed protection, range use, wood technology, and many other phases of forest management and utilization.

A growing population and expanding economy are certain to make increasing demands on the forests.

There is opportunity, therefore, for even greater progress in American forestry in the next half-century than has been made in the half-century just completed. May the United States also contribute its full share to the continued advance of world forestry, and thus help toward sounder economies and improved living conditions for all the peoples of the world.

Forestry and Technical Assistance in Pakistan

A Sample of Co-operative Effort through National, Bilateral and International Programs

by Robert K. Winters
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Pakistan, the largest Muslim State in the world, has an area of approximately 235 million acres, but is divided into two halves separated by more than 1,000 miles of India. This physical separation and the specific location of the boundaries between Pakistan and India are largely the result of concentrations of Muslim population. In general, Muslim areas of prepartition India became Pakistan, and Hindu and other non-Muslim areas remained in India.

The land area of West Pakistan is 200 million acres and the population 33.8 million persons, giving a population density of 109 per square mile. In East Pakistan, the land area covers 35 million acres. The population totals 42 million, and the population density is 770 per square mile. Since 80 percent of the total population lives on farm land, the economy of the nation is predominantly agricultural.

West Pakistan, except for the upper slopes of the mountains that flank it on the north and west, is hot and dry. Large areas are absolute desert. Since the region lies between latitudes 24° and 37° N., the maximum summer temperatures range between 90° and 120° F., and except at altitudes above 5,000 feet, the minimum winter temperatures are rarely below freezing. Much of West Pakistan has an annual rainfall of less than 10 inches, some of it less than 2 inches. The portions at higher altitudes have progressively heavier rainfall (35 inches at Abbottabad at an elevation of 4,500 feet and 50 inches at 7,500 feet in the same vicinity). Much of the agriculture is in the plains and depends upon irrigation. Wheat is the principal agricultural crop.

In contrast, East Pakistan, situated at the mouth of the Ganges and Brahmaputra Rivers, between latitudes 21° and 27° N., is in the path of the southwest monsoons and receives an abundance of rainfall — 85 to more than 200 inches per year. Nearly all this rain falls during the monsoon season — 15 June to 1 October. The maximum summer temperature seldom exceeds 100° F., and the minimum winter temperature rarely is less than 40°-45° F. The relative humidity is high, especially during the monsoon season.

Industrially, Pakistan is just beginning to develop. In the partition of India, much of the industrial capacity and leadership was concentrated in the area that became India. For example, the bulk of the jute was grown, and is still grown, in what is now East Pakistan, but almost without exception the jute processing mills were in the vicinity of Calcutta, in present-day India. In the eight years since partition, the number and capacity of the jute mills in East Pakistan have increased sufficiently to handle much of the domestic jute production. An automobile assembly plant has recently begun operation in Karachi; a pulp and paper mill in East Pakistan is now producing paper from local bamboo. Local venture capital appears to be available for investment in proved industrial enterprises. The Pakistan Industrial Development Corporation, a government-sponsored organization, constructs and operates new industries until their success is assured, after which up to 49 percent of the stock is offered to private investors.

Industrial development is to be still further accelerated. Many commodities that could be produced locally are now imported, with a consequent heavy drain on the nation's limited foreign exchange. Furthermore, some local products — for example, cotton and jute — are shipped abroad raw or semiprocessed, whereas complete manufacture of the finished product would provide local employment and add materially to the value of the exported products. The current plans for the development of the country quite properly stress industrial development along with improvements in agriculture.

Transportation systems of West Pakistan differ greatly from those of the eastern wing of the country. West Pakistan has more than 5,300 miles of railroad and about the same length of surfaced roads, but has practically no navigable inland waterways. East Pakistan, on the other hand, has only 1,600 miles of railroad and almost no surfaced roads, but has more than 4,500 miles of navigable inland waterways.

Unfortunately, Pakistan is deficient in a number of natural resources. Supplies of economically accessible coal, oil, and commercially important minerals are not great. Even the forest area is small in proportion to the total land area and to the size of the population. Because of the shortage of coal, oil, and other fuels, wood is an important fuel throughout the country. Where wood is not available, as in much of West Pakistan, dried cow dung is widely used as fuel. Woodworking industries, of course, cannot develop without a dependable supply of reasonably cheap and accessible wood. Therefore, development of the forest is important, especially with respect to fuel supplies and industrial raw material.

The Forest

Unfortunately, precise information on forest area and timber volume is lacking. Estimates of the potential forest area range as high as 10 to 12 million acres, of which perhaps no more than half is supporting tree growth. The remainder is usually wild land supporting

a cover of brush, tall grass, bamboo, or other non-tree vegetation. This distribution means that, at most, less than 3 percent of the total land area can be considered as forest area. As far as can be ascertained from available data, there is approximately the same amount of forest area in West Pakistan as in East Pakistan, but, because of the large land area in West Pakistan, the ratio between forest area and total land area in that wing of the country is much lower than that of East Pakistan.

Considering the nation as a whole, approximately three-quarters of the forest area belongs to the several provinces as constituted at the time of writing. Most of the remainder, almost entirely in West Pakistan, is in private ownership. The Central Government owns no forest land.

Forest land under provincial control is of two principal kinds:

a) reserved forests;
b) unclassed state forests.

Reserved forests are publicly-owned forest lands that are managed for the production of timber or other forest products, or for the protection of soil from erosion. Unclassed state forests are publicly-owned forest lands that are not subject to management. Ordinarily unclassed forest lands have against them a private right that interferes with their unrestricted operation as public-forest enterprises. For example, large areas in the Chittagong Hill Tracts of East Pakistan have to be designated as unclassed state forests because of the vested rights of Chakma and other tribesmen in the area. Long-standing pacts with their chiefs give the tribesmen the right to cut forest products and to clear land in these areas for cultivation. However, as the private rights on unclassed state forests are extinguished by cash settlement or otherwise, these areas tend to become reserved forests.

In East Pakistan and certain provinces in West Pakistan, a third classification, vested forests, is also recognized. These are privately-owned forest areas that are managed by the Government. The area in this category is very small. In East Pakistan, nearly 60 percent of the forest area is reserved, and nearly all the private forest is dedicated either to the production of forest products or to the protection of the soil.

The character and distribution of the forest differ greatly between West and East Pakistan. In West Pakistan, the highest quality forest is found largely in the mountains where rainfall is sufficient to permit tree growth. Forest is also found along streams and irrigation canals in lower and more arid portions of the country and on dry hills and plains, especially in the Punjab and in Baluchistan. The richest forest flora is of course found in the hill and mountain districts in the north and northwest at elevations from 3,000 to 13,000 feet above sea level.

The forest of this zone is mainly coniferous. Deodar [*Cedrus deodara* (Roxb.) Loud.], *Pinus griffithii* McClell. (syn. *P. excelsa* Wall., not Lam.), *Picea smithiana* Boiss. (syn. *P. morinda* Link), *Abies* spp., *Pinus roxburghii* Sarg. (syn. *P. longifolia* Roxb., not Salisb.) and others are found. Common broadleaf associates are oaks, maples, willow, birch, horsechestnut, poplar, and walnut. Some of the forest area, particularly on the steep upper mountain slopes, is commercially inaccessible.

At lower elevations and under drier conditions, hardier and more drought-resistant species occur, *Pinus gerardiana* Wall. and *Juniperus* spp. Along the streams and irrigation ditches are shisham (*Dalbergia sissoo* Roxb.) and babul (*Acacia arabica* Willd.), also *Prosopis spicigera* L., *Tamarix* spp., and *Populus euphratica* Olivier.

The development of forest industries in West Pakistan is limited because timber is not readily accessible. To supplement the local supply, logs and cants are imported from Malaya, Burma, and East Pakistan. For the most part, logs produced locally are sawn by hand at the stump into cants or thick lumber, which in the steepest country is carried by two to four men to the nearest road or stream. In Karachi, Lahore, and other large centers, cants and other thick stock are resawn on band or circular table saws into lumber. Produced under these conditions, lumber is expensive ($350 to $400 per 1,000 board-feet for ordinary construction lumber). Wooden sports goods (tennis rackets, hockey sticks, etc.) are manufactured at Sialkot, and a veneer and plywood plant began operation in Karachi in 1954. Crude gum is produced from *Pinus roxburghii* in the northern portion of West Pakistan and is processed to turpentine and rosin near Lahore. During recent years, the average annual receipts of crude gum have totaled about 2,000 metric tons. Certain drugs, chiefly ephedrine and santonin, are produced from trees or shrubs in the forests of West Pakistan.

In East Pakistan, there is a large area of practically virgin and merchantable second-growth hardwood timber. Most of the virgin area is found in the Chittagong-Cox's Bazar area, a hilly submountainous area between the Bay of Bengal and Burma. The second-growth timber is chiefly found in the Sundarbans, a low swampy area of about a million acres adjacent to the numerous mouths of the Ganges-Brahmaputra River system. In this area the timber is readily accessible because of the interlacing network of waterways and has for many years supplied the nearby Calcutta market and that of the adjacent heavily populated rural areas.

The forest of the Chittagong-Cox's Bazar area is of two general types, tropical evergreen forests, and mixed deciduous and evergreen forests. In addition, there are areas of plantations, bamboo and savannahs.

The tropical evergreen forest is usually found in moist, deep valleys and on the more moist slopes that face the north, northeast, and east. The largest trees in the overstory exceed 100 feet in height and are chiefly of the following species: chaplash (*Artocarpus chaplasha* Roxb.), used mainly for light construction, furniture, boat-building, and paneling; telsur (*Hopea odorata* Roxb.), boat-building and interior use; mainakat, (*Tetrameles nudiflora* R. Br.), suitable for tea chests and boxes; and narikel (*Sterculia alata* Roxb.), suitable for tea chests, plywood, boxes. The most common species in the story immediately beneath this overstory are: pitraj (*Amoora rohituka* Wight & Arn.), house-building and furniture; and toon (*Cedrela toona* Roxb.), boat building and furniture. Even a third story of fuelwood species is found on many areas.

The overstory of the mixed deciduous and evergreen forest, in addition to one or several of the above, contains deciduous species including principally garjun (*Dipterocarpus* spp.), used for construction, railway sleepers, and house building; civit (*Swintonia flori-*

An elephant is used to assemble plantation-grown teak logs preparatory to raft formation on the Karnaphuli River in East Pakistan.

bunda Griff.), practically not used at present but suitable for packing boxes, matches, and possibly plywood, and paper pulp; and koroi (*Albizzia procera* Benth.), potentially a source of paper pulp. This overstory varies in height from 150 to 200 feet. Beneath it is a second story of many species, mostly evergreen, 50 to 80 feet tall. Beneath this is still a third story, also mostly evergreen, ranging in height from 25 to 50 feet.

Approximately 11,000 acres of plantations, mostly teak (*Tectona grandis* L. f.), have been established in the Chittagong-Cox's Bazar territory. About 85 percent of this area has been established since 1930, and the current rate of establishment is about 700 acres annually.

The forest of the Sundarbans area is made up of species that can grow on a close, clayey soil where the tide inundates the base of the trees frequently with salty or slightly brackish water. In general, the degree of salinity of the water divides the forest area into three zones: the comparatively fresh-water areas, the moderately saline, and the salty. The quality and density of the forest are best in the relatively fresh-water areas to the northeast, and become progressively poorer toward the south and west.

In the fresh-water areas during the rainy season, the rivers and creeks are either entirely fresh or are only slightly saline, and the soil receives annually a fresh deposit of silt or clay. Here the predominant species is sundri (*Heritiera minor* Roxb.), a heavy wood commonly used for boat-, carriage-, and cart-building, and for posts and poles. The best sundri forest is found on the areas that are well drained at each ebb tide. With it is associated gewa (*Excaeceria agallocha* L.), used for boxes, matches, and potentially for groundwood and other paper pulp which accounts for about 20 percent of the stand mixture in the northeast and about 50 percent near the boundary of the moderately saline area. Other species in approximate order of importance are: passur (*Carapa moluccensis* Lam.), furniture, handles, firewood; kankra (*Bruguiera gymnorhiza* Lam.), firewood, houseposts; keora (*Sonneratia apetala* Ham.), house- and boat-building, boxes. Along streambanks golpatta (*Nipa fruticans* Wurmb.), a palm whose leaves are widely used for roof-thatching, is abundant. Ordinarily, the freshwater forest is relatively free of undergrowth

The moderately saline areas are usually found nearer the sea where the water is salty during the dry season but only slightly salty during the rainy season. Here the principal tree species are gewa and sundri — the proportion of the latter decreasing as the salinity of the water increases.

In the salty areas where the water is salty the year round, the forest consists mainly of scattered and stunted gewa, 10 to 12 feet in height.

Mechanized forest industries are being introduced into East Pakistan. Before 1947, sawmills, paper mills, veneer and plywood plants, and other forest

industry plants serving what is now East Pakistan were largely in Calcutta or other centers now in India. In 1954, a pulp and paper mill at Chandraghona, East Pakistan, began operation on local bamboo. A few small sawmills and one small veneer plant are operating, and the construction of others is planned. Most of the lumber and railway sleepers are hand sawn. A wood preserving plant near Chittagong treats the sleepers used by the East Bengal Railway system.

Administration of the Forest

The Conservators of Forests are responsible for the administration of provincial forests. In one or two provinces the forests are sufficiently important to warrant a chief conservator plus several conservators. Immediately beneath the conservators, organizationally, are the divisional forest officers, in charge of individual forest administrative units, called forest divisions. Forest rangers report administratively to divisional forest officers. Beneath the forest rangers are assistant rangers, foresters, and forest guards.

The Inspector-General of Forests, currently Y. S. Ahmad, is the Chief Forest Officer of the Central Government and is the co-ordinator of forestry in Pakistan. Although he has no direct administrative control over the provincial forests, he does have considerable influence on forestry within the nation. His judgment is influential in providing grants or subsidies from the Central Government to the Provincial Governments for forestry purposes. Periodically, he inspects the forest organization in the various provinces and may recommend action to the Provincial Government, which, in turn, may instruct the chief conservator or conservator accordingly. The Inspector-General is responsible for national planning in the field of forestry; for compiling forest statistics on a national basis; for operation of the professional forestry school, now at Abbottabad and presently to be moved to Peshawar; and for the operation of the Forest Research Institute at Abbottabad and the Forest Research Laboratory at Chittagong. Furthermore, he represents Pakistan at international forestry meetings.

Technical Aid Program

Current data showing the annual production of timber products for Pakistan are not available. The most recent (1952) figures for the entire nation indicate a total recorded production of about 9 million cubic feet for industrial products, excluding fuelwood. Recorded fuelwood production was five times this quantity. The size of the unrecorded production is probably very much greater than the known production.

Loose rafts of logs of Dipterocarpus *spp. at low tide along the Karnaphuli River near Chittagong, East Pakistan. Note the bundles of bamboo needed to float the logs.*

Preparing to move a log of Dipterocarpus *spp. into the sawmill of the East Bengal Forest Department at Kalurghat.*

The forest resource and its potentialities are now being inventoried and Pakistan's planners are hoping that the forest product industries will presently be able to produce most of the wood items that are now being imported and will also produce useful items not now being used locally. To accomplish this plan, several obstacles must be overcome. First, much of Pakistan's choicest timber is economically inaccessible because of current logging and transporting practices. Through mechanization, improved management, and the introduction of other efficient methods, logging and manufacturing costs can probably be reduced. Lower costs will permit the opening up of currently inaccessible timber stands and thereby increase the forest resource base upon which domestic industries can be built.

The second obstacle is, as usual, the lack of precise knowledge concerning the properties of some local wood species or concerning the manufacturing methods that will produce serviceable products from them. In the Chittagong Hill Tracts, by way of example, is found a relatively large volume of civit that is today practically unutilized. Trees five to seven feet in diameter and 200 feet tall occurring in mixture with the more valuable species are felled and burned in the land-clearing operation which follows commercial logging and precedes the establishment of a teak plantation on a cutover area. Tests of some properties of civit have been made at Dehra Dun, India, and elsewhere; others are needed. Furthermore, wood of this species should actually be used on an experimental basis to make products for which its physical properties seem to be suited. In this manner, suitable processing methods can be developed.

With these obstacles to overcome, the Government of Pakistan first approached the Food and Agriculture Organization of the United Nations. Four forestry technicians of that organization (Alexander Rule, logging expert; F. Cermak, sawmilling expert; J. A. von Monroy, forest industries expert; and Arne Sundelin, pulp and paper expert) visited Pakistan and made recommendations in their individual fields of specialization. The Technical Co-operation Administration (afterwards the Foreign Operations Administration) of the United States of America ultimately became interested in implementing some of the recommendations of these experts. The outcome was a request from the Government of Pakistan for the establishment of two forestry projects under the foreign aid program of the United States Government.

Introduction of equipment

The first of these projects was designed to train forest officers of the Government of Pakistan in the use of mechanical logging and timber-processing equipment in the Chittagong Hill Tracts. A small number of logging tractors and logging arches were to be acquired, along with a machine shop to keep the equipment operating. One or more technicians from the United States were to go to Pakistan on a two-year assignment to train local technicians in the operation and proper maintenance of the equipment, in building logging roads, and in planning the entire logging operation. In addition, the Pakistan technician who was to have charge of the project was to be sent to the United States for training in logging methods similar to those that could be used in East Pakistan.

At the end of 1952, a technician from the United States Forest Service, Maxwell E. Becker, was sent to Pakistan to begin the project. Early in 1953, K. A. Miedler, an Austrian technician employed by the Food and Agriculture Organization of the United Nations, visited the logging area with Mr. Becker. As a result, logging equipment, repair parts, and machine-shop equipment were ordered, the bulk of which was received in Chittagong in the winter of 1954-55. In the meantime, Nuruddin Ahmed, a Pakistan technician,

was sent to the United States for approximately 6 months of training in mechanical logging and wood-processing methods. In September 1954, Paul Logan, logging engineer from the United States Forest Service, took over the duties of Mr. Becker at the termination of his tour of duty.

In the meantime, the scope of the log-extraction project was enlarged to include the acquisition and construction of a modern sawmill, and the training of personnel in its operation. The details of this project are still being worked out. It is possible that a preservative treating plant and still other wood-processing units may later be added.

Forest Research Laboratory

The second forestry project, the establishment of the Forest Research Laboratory, also got under way at the end of 1952 with the assignment of the writer to Chittagong, East Pakistan, where the proposed laboratory was to be constructed. The first step was the preparation of a problem analysis describing local forestry conditions and forestry problems that required research. This work, of course, was prepared in close collaboration with local technicians who were currently concerned with these problems, and with J. A. von Monroy of FAO. Because personnel and funds were likely to be limited for forestry research in East Pakistan in the immediate future, initial effort of the Forest Research Laboratory was to be concentrated in the field of forest products research. This decision recognized the need for increasing the contribution of the local wood-products industries to national self-sufficiency.

To meet this local need, four fields of research were given highest priority:

1. wood seasoning;
2. wood preservation;
3. veneer, plywood, and building board;
4. woodworking shop (use of modern machinery in woodworking).

Wood-seasoning research is very important in Pakistan. Improperly seasoned wood of many local species shrinks, warps, and checks in use and is unfit, or at least undesirable, for certain purposes. Furthermore, certain uses of unseasoned or partially seasoned wood invite decay and make necessary early and often costly replacement. Research in the wood-seasoning field is needed to determine the conditions under which kiln-seasoning of lumber and other forest products is advisable and to work out the best kiln schedules for the more important local species.

For similar reasons the field of wood preservation is also important, especially in East Pakistan where warm weather prevails most of the year and where the humidity is especially high during the monsoon season. Not only is wood decay fairly rapid, but losses caused by insects, particularly termites, are heavy. Research is needed to ascertain pressures and quantities of several kinds of wood preservatives necessary to give protection to the nondurable local species.

Both West and East Pakistan have a number of species that should be suitable for veneer and plywood. A local supply of plywood suitable for tea chests is of especial importance at present, since practically the entire tea crop is packed in chests made from $\frac{1}{4}$-inch plywood manufactured in Finland and paid for through foreign exchange. Furthermore, a suitable commercial grade of plywood would meet construction, decorative, and furniture needs. Research on a laboratory scale is needed to solve the problems of cutting, drying, and gluing native species. Once these problems are solved, venture capital may be induced to undertake production on a commercial scale. In plywood for tea-chest panels, strength and freedom from odor are important. The manufacture of a serviceable building board from local species not now used would also provide a much-needed construction material from wood now wasted. Research on bonding agents, methods of shredding or fiberizing, and methods of board formation are needed before commercial production can be undertaken.

From one point of view the operation of a woodworking shop might not be considered research. Yet the use of machines in turnery and in other factory operations using wood species not heretofore used will almost certainly present problems in operating methods, speed of machines, set of knife blades, etc. Furthermore, in communities where individual craft production methods have prevailed for centuries, the advantages of mass-producing and assembling identical and interchangeable furniture and wood equipment parts must be demonstrated. In addition, machine operators must be trained if the more efficient factory methods are to be introduced. For these reasons the operation of a woodworking shop as part of the Forest Research Laboratory seems warranted.

A project designed to test the strength of the native timber species was considered and rejected, largely because the most important species had already been tested for strength and other mechanical properties at the Forest Research Institute at Dehra Dun, India. Most of the results of these tests are available in published form.

After deciding on the fields of work in which initial research should be concentrated, the next step was to design suitable laboratory buildings. To take the initiative in this phase of the work, Laurence V. Teesdale of the Forest Products Laboratory, Madison, Wisconsin, spent several weeks in Chittagong. After thoroughly considering plans of other laboratories, four separate buildings aggregating approximately 14,000 square feet of floor space were agreed upon and rough sketches prepared. Three single-storied laboratory buildings of brick and concrete were to house the actual laboratory equipment. The fourth, a two-storied brick and concrete administration building, was to house the principal offices, library, clerical section, etc. These sketches were revised by the architect of the Foreign Operations Administration and were turned over to the Pakistan Public Works Department for drafting of final architectural plans, making cost estimates, issuing construction bids, and awarding construction contracts.

Simultaneously with the designing of the buildings, a list of laboratory equipment and supplies was prepared and submitted through the usual official channels for revision and ultimate purchase in the United States. This list included the appropriate experimental seasoning kilns; preservative treatment tanks and pressure cylinders; and veneer lathes, knives, driers, and presses; together with the machines for a modest woodworking shop. In addition, several hundred books were selected

The sawmill operated by the East Bengal Forest Department at Kalurghat: in the foreground are plantation-grown logs and, left, railway sleepers sawn from logs of Dipterocarpus *spp.*

as the beginning of a technical library, and the necessary chemical and expendable supplies were also ordered. These items the United States Government was to buy and pay for in dollars. The Pakistan share in the co-operative agreement was the procurement of land and the construction of buildings.

While these preparations were being made, negotiations were under way to secure an appropriate site. The one selected is on the outskirts of Chittagong about four miles from the downtown area. Approximately half of the 42-acre site was initially the property of the East Bengal Forest Department and was readily made available. The remainder, the most suitable construction site, was acquired from private owners. By the time the architectural drawings had been prepared from the initial layout sketches and construction bids had been issued, the site had been acquired. Site preparation and building construction began early in September 1954 and were nearly completed in March 1955.

The training of Pakistan laboratory technicians has been handled as follows: the officer selected as ultimate director of the laboratory had been sent to the United States for training at Madison, Wis., before any United States technicians were sent to Pakistan. He returned to Pakistan in time to aid in securing title to the building site, in preparing the building sketches, and in drafting the preliminary equipment order. By the end of 1954, four technicians had been selected to be sent to the United States for a six-month training period, one in each of the following fields: wood seasoning; wood preservation; veneer, plywood and building board; and woodworking.

Forestry education

Technical aid programs will be contributing to forestry in Pakistan in still another way. Prior to the partition of British India, foresters were chiefly trained at Dehra Dun. In the partition, this educational and research institution fell to India, thus forcing Pakistan to organize its forestry education from the beginning. Initially forestry instruction was offered at Murree Hills in far from satisfactory accommodations. The program was that each year approximately 30 Forest Rangers should graduate from the Ranger School and be assigned to positions in one or another of the provincial forestry departments. Every second year a class of about 15-20 senior forest officers would graduate from the Forestry College and enter the superior cadre of the provincial forestry departments.

In 1952, more suitable quarters than those at Murree Hills were made available at Abbottabad, but even there instruction and laboratory facilities were far from ideal. In 1954, negotiations with the Government of Pakistan, the Foreign Operations Administration, and the Colorado Agricultural and Mechanical College pointed the way to the construction of new forestry educational and forest product laboratory facilities as an integral part of the University of Peshawar. According to the plans, the Government of Pakistan would construct the buildings at Peshawar; the Colorado Agricultural and Mechanical College would provide certain faculty advisers; and the Foreign Operations Administration would purchase laboratory and other equipment and would bear the cost of the faculty advisers. By these means, forestry education in Pakistan could be strengthened.

In summary, forestry is helping Pakistan to become industrially more self-sufficient and economically stronger. With a little financial and technical aid at the outset, Pakistan's vigorous forestry leadership will go far to increase the contribution of the forest resource and industry to the national economy. And all the foreign technicians who have been involved can justly be proud to have had a small share in this undertaking.

Commodity Report

Roundwood.* 1946-1954

When the second world war ended, there were great requirements for wood and for all the products to be derived from wood. Fuelwood still had to replace coal in many countries which once could import this commodity. Sawnwood was essential for reconstruction work, and wood pulp and its derivatives were everywhere badly needed. Plywood, veneers and board were in great demand. Electrification and improvement of the railway network resulted in an increased demand for posts, poles and sleepers although in some countries electric fencing and steel or concrete sleepers and pylons were tending to displace wood.

Production from the world's forests responded in the way shown in Table 1, which also gives the total recorded removals of roundwood from 1946 to 1954 and compares these with the prewar level 1937/38. The gradual increase in the volume of wood production from nearly 1,300 million cubic meters in 1946 to about 1,500 million cubic meters (a rise of 15 percent) reflects mainly a greater output of wood destined for industrial uses, from 614 million cubic meters to 828 million or 35 percent larger. The relative production of fuelwood tended to decline so that industrial wood represented an increasing share of total fellings. The figure was 48 percent prewar, then dropped to 47 percent in 1946 because of the wide demand for wood as fuel, but was 51 percent in 1950 and 55 percent in 1954.

The record of timber felled over the past nine years in the FAO regions is shown in Table 1. In *Europe*, the level of total roundwood production immediately after the war considerably exceeded the volume warranted by traditional silvicultural practices. As economic conditions improved, fellings were gradually decreased to a level which seemed better to correspond to the sustained productive capacity of Europe's forests. At the same time, there was a spectacular fall in the volume of wood cut for fuel, from 155 million cubic

* This report treats "roundwood" as a general commodity, with no differentiation into hardwood and softwood.

TABLE 1. – WORLD PRODUCTION OF ROUNDWOOD, IN FUELWOOD AND INDUSTRIAL WOOD, 1937/38 AND 1946-54

in millions of cubic meters

Year	Type	World	Europe	U.S.S.R.	North America	Latin America	Africa	Asia	Pacific Area
1937/38	Roundwood	1 198	304	262	267	150	85	120	10
1946	"	1 299	300	250	348	165	109	110	17
1947	"	1 310	300	260	349	165	105	113	18
1948	"	1 333	290	275	362	171	102	115	18
1949	"	1 317	260	290	346	177	107	118	19
1950	"	1 356	275	300	364	166	106	125	20
1951	"	1 413	270	335	380	170	107	130	21
1952	"	1 422	270	365	374	164	107	121	21
1953	"	1 455	250	400	372	164	118	129	22
[1] 1954	"	1 496	258	435	370	165	118	128	22
1937/38	Fuelwood	626	134	142	52	140	83	70	5
1946	"	685	155	125	70	150	105	70	10
1947	"	675	150	130	60	150	100	75	10
1948	"	650	120	135	60	155	95	75	10
1949	"	665	100	140	75	160	100	80	10
1950	"	660	125	140	60	150	100	75	10
1951	"	665	110	150	70	150	100	75	10
1952	"	655	105	160	65	145	100	70	10
1953	"	660	100	170	60	145	110	75	10
[1] 1954	"	660	95	175	60	145	102	73	10
1937/38	Industrial Wood	572	170	120	215	10	2	50	5
1946	"	614	145	125	278	15	4	40	7
1947	"	635	150	130	289	15	5	38	8
1948	"	683	170	140	302	16	7	40	8
1949	"	652	160	150	271	17	7	38	9
1950	"	696	150	160	304	16	6	50	10
1951	"	748	160	185	310	20	7	55	11
1952	"	767	165	205	309	19	7	51	11
1953	"	785	150	230	312	19	8	54	12
[1] 1954	"	828	163	260	310	20	8	55	12

[1] Provisional.

meters in 1946 to only some 95 million cubic meters in 1954. Industrial roundwood cut rose by almost 12 percent during this period, from 145 million cubic meters to about 163 million cubic meters.

The continuation of the war-time expansion of forest industries in *North America* saw roundwood removals rise from 348 million cubic meters in 1946 to 370 million cubic meters in 1954, accompanied by a decline of some 14 percent in the volume of reported fuelwood production. More and more wood served as industrial raw material, in 1954 about 84 percent of the figure cited above.

The *Soviet Union* was the world's largest timber producer before the war, but production in 1946 was 12 million cubic meters less than the prewar output. The reconstruction effort and industrial expansion gradually resulted in an increased volume of fellings and the cut in 1954 apparently considerably exceeded the immediate prewar level. Exploitation was increasingly extended into the northern parts of the country and into Siberia. The planned figure for roundwood fellings in 1954 was 435 million cubic meters, a figure which meant a rise in the volume of industrial roundwood produced during the period under review of close to 74 percent, and a 40 percent rise in fuelwood fellings. This increased production followed the trend in other regions; in fact the proportion of fuelwood in total removals declined from 50 percent in 1946 to 40 percent in 1954.

During the war years, considerable encouragement was given to developing forest industries in certain countries of *Latin America*. Total roundwood output in 1946 was 10 percent above prewar and a further 8 percent rise was recorded in 1949. Thereafter, output declined, reflecting a reduction in fuelwood cut, but the total volume regained the 1946 level in 1954 when the output of industrial wood which earlier only represented some 10 to 12 percent of the region's total fellings, reached just 200 percent of the prewar figure and exceeded the 1946 level by one-third.

In *Africa*, the recorded output of roundwood in 1946 was 28 percent higher than before the war and, after a fall in 1947 and 1948, climbed higher to 39 percent above the prewar level. Industrial timber has only represented a very small percentage of the total wood output — 2 percent before the war, 4 percent in 1946 and 7 percent in 1954; but the increase of production that has occurred, though small in volume, is high percentage-wise: in 1953/54, 300 percent over the 'thirties. The war induced a heavy increase in both timber and fuelwood output and after the war there was a strong drive to develop new forest industries in the dependent territories of European powers.

In *Asia*, the dislocation of the war led to a large drop in timber output. In spite of this region's great needs, arising both from increasing industrial activities and ever-growing populations, the reported volume of roundwood production had by 1954 only slightly exceeded the prewar level. Fuelwood production apparently did not change during the years under review but output of industrial roundwood rose by some 15 million cubic meters, or by 38 percent, still, of course, quite insufficient to meet requirements.

The expansion of timber output, started in the *Pacific* area during the war, continued at a steady pace. Production of industrial roundwood rose by over 71 percent from 1946 to 1954 while the output of fuelwood remained steady.

Industrial development and population increase

It is of interest to examine how forest production in different parts of the world has followed industrial and economic development and how it has kept pace with population increases. It is known that fuelwood production has everywhere decreased, so, if total cut is taken as the basis of comparison, a wrong picture is obtained and output from the forest seems to have been lagging far behind in all regions except *Australasia*. However, judging by the output of industrial wood only, a more satisfactory situation appears. In *North America*, the index of total industrial production increased by more than 25 percent during the period under review which, although more than double the percentage rise in output of all industrial roundwood, is less than the rise in pulpwood output. The gross industrial production of the *Soviet Union* trebled from 1946 to 1954; the total output of industrial roundwood more than doubled while the production of pitprops and pulpwood in 1954 was four times that in 1946. In *Latin America*, *Africa* and the *Pacific Area*, the increase of industrial roundwood production seems to have more or less kept in step with the rate of increase in industrial output and with other economic developments. On the other hand, *European* production of industrial roundwood rose by only 12 percent from 1946 to 1954 while industrial activity increased by more than 50 percent. In *Asia*, too, output of industrial roundwood in general lagged far behind the rate of industrial development.

A fine comparison between forest production and population increase may appear far-fetched at the present state of our statistical knowledge but world population is estimated to have increased by some 9 percent from 1946 to 1953, that is from 2,304 million to 2,508 million, while total roundwood removals increased close to 15 percent and output of industrial roundwood by 35 percent. There may be justification for saying, therefore, that, since the war, forestry production in the broad view has kept pace with the growth of world population, as is suggested in the accompanying Table:

TABLE 2. – COMPARISON BETWEEN FOREST PRODUCTION AND POPULATION INCREASE, 1946 - 53

Region	Increase of fellings of industrial wood	Increase of population
	Percentage: 1946 = 100	
Europe	12	6
U.S.S.R.	108	10
North America	12	13
Latin America	33	18
Africa	100	12
Asia	37	7
Pacific Area	71	17
WORLD	35	9

This statistical picture must be qualified by clearly recognizing that wood requirements of growing populations are greatest where there has been least development in forest production. Despite the progress apparent during the 1946-53 period, forest utilization still drags considerably behind needs.

Changes in demand for wood

As already pointed out, the keener demand for industrial roundwood has in part been met by diverting to industrial purposes wood formerly disposed of as fuelwood. In the *Soviet Union*, *Australia* and *New Zealand*, the demand seems to have been met entirely by stepping up total fellings. In *Europe*, fuelwood cutting has purposely been drastically reduced to permit increases in the amount of wood available for industry.

Supplies of industrial roundwood still remain generally inadequate to meet fully the needs of all forest industries, so that competition for raw material has grown during recent years between, for instance, sawmills on the one hand and the pulp and paper industries on the other. As is shown in Table 3, while availabilities of industrial wood of all categories have shown an average increase of some 35 percent since 1946, sawlog volumes have increased by only 30 percent against about 60 percent for small-sized timber for pulpwood and pitprops.

In the highly industrialized areas of *Europe* and *North America*, the recorded volume of sawlogs, veneer logs and logs for sleepers produced has remained practically unchanged, and the increase in total supplies of industrial wood really reflects more and more pulpwood, because the amount of timber used as pitprops has generally declined. European output of logs has been maintained at around 104 million cubic meters per year while the production of small-sized timber has risen from 43 million cubic meters in 1946 to about 60 million cubic meters in 1954. In Canada and the United States the volume of log output has fluctuated between roughly 215 and 220 million cubic meters while the production of pulpwood has risen from 67 million cubic meters to close to 95 million cubic meters in 1954. In the Soviet Union the volumes of both logs and small-sized industrial roundwood (pulpwood and pitprops) have shown increases. The increase in output of logs may be considered as a normal expression of the reconstruction and expansion that has been going on. The big rise in coal production in the *Soviet Union* has necessitated large amounts of pitprops, even with the technical advances in the use of wood in the mines. Gains in

TABLE 3. – WORLD PRODUCTION OF INDUSTRIAL WOOD

Year	Industrial Wood		Sawlogs		Pulpwood and Pitprops	
	Million m³	Percent 1946 = 100	Million m³	Percent 1946 = 100	Million m³	Percent 1946 = 100
1937/38	572	93	400	103	110	89
1946	614	100	390	100	124	100
1947	635	103	415	106	135	109
1948	683	111	420	108	152	123
1949	652	106	405	104	148	119
1950	696	113	455	117	156	126
1951	748	122	465	119	183	148
1952	767	125	480	123	184	148
1953	785	128	495	127	178	144
[1]1954	828	135	505	129	197	159

[1] Provisional.

TABLE 4. – EXPORTS OF CONIFEROUS LOGS
in thousands of cubic meters (r)

Region	1946	1947	1948	1949	1950	1951	1952	1953	1954
Europe	*1 095*	*3 247*	*2 936*	*1 985*	*1 222*	*1 070*	*983*	*700*	*984*
of which:									
Belgium-Luxembourg [1]	1	5	6	7	48	135	58	102	87
Czechoslovakia	6	26	[2] 13	[2] 8	[2] 50	[2] 11	[2] 16	[2] 40	[2] 36
Finland	85	167	304	236	522	666	699	272	400
France	13	22	61	158	228	145	85	151	221
Germany, Western	*500	*2 400	*2 380	*1 430	278	43	3	25	1
Sweden	61	36	26	42	32	30	48	61	107
Yugoslavia	*10	*30	100	11	4	4	17	20	5
U.S.S.R.	**10*	**50*	[2] *24*	[2] —	[2] *1*	[2] —	[2] —	[2] *58*	[2] *10*
North America	*201*	*237*	*357*	*373*	*274*	*332*	*312*	*495*	*604*
Canada	171	152	254	184	144	70	111	106	122
United States	30	85	103	189	130	262	201	389	482
Latin America	*1*	*1*	*1*	*6*	*7*	*6*	*2*	*2*	*2*
Africa	*3*	*4*	*5*	*8*	*2*	*2*	*2*	*2*	*2*
Asia	*20*	*5*	*10*	*7*	*5*	*5*	*4*	*8*	*7*
Pacific Area	*5*	*6*	*4*	*4*	*4*	*4*	*10*	*4*	*4*
WORLD	*1 340*	*3 550*	*3 340*	*2 380*	*1 520*	*1 420*	*1 310*	*1 270*	*1 610*

* Unofficial estimate. [1] Includes poles, piling and posts. [2] Importers' figures; exports to countries of Western Europe.

TABLE 5. – EXPORTS OF BROADLEAVED LOGS

in thousands of cubic meters (r)

Region	1946	1947	1948	1949	1950	1951	1952	1953	1954
Europe	*270*	*284*	*385*	*365*	*484*	*631*	*396*	*503*	*670*
of which:									
Belgium-Luxembourg [1]	20	16	24	38	116	156	76	79	88
Finland	17	29	11	32	41	92	67	38	60
France	91	92	130	178	261	363	320	344	482
Germany, Western	*100	*100	*150	*60	27	7	3	6	5
Yugoslavia	*10	*10	52	46	29	1	3	5	3
U.S.S.R.	*5	*5	[2] —	[2] 3	[2] —	[2] —	[2] —	[2] 1	[2]
North America	*124*	*219*	*253*	*240*	*204*	*225*	*215*	*244*	*250*
Canada	84	97	113	119	114	125	125	110	97
United States	40	122	140	121	90	100	90	134	153
Latin America	*170*	*210*	*190*	*210*	*180*	*240*	*200*	*190*	*200*
of which:									
British Honduras	9	13	15	45	41	13	10	10	
Mexico	11	23	12	32	31	43	43	*43	
Brazil	94	77	109	74	40	93	46	27	
Surinam	28	74	30	15	11	19	15	14	
Africa	*570*	*720*	*880*	*960*	*1 290*	*1 770*	*1 120*	*1 550*	**1 600*
of which:									
Belgian Congo	53	75	60	54	108	122	90	145	...
French Cameroons	28	39	55	48	69	68	*60	50	...
French Equatorial Africa	145	213	295	350	*375	438	*300	375	...
French West Africa	50	60	79	82	108	*110	*50	131	...
Gold Coast	116	148	177	174	231	259	213	294	...
Nigeria	64	76	91	124	231	607	218	335	290
Asia	*100*	*180*	*280*	*400*	*1 200*	*1 340*	*2 170*	*3 160*	**3 300*
of which:									
British North Borneo	*50	51	113	119	122	133	101	161	355
Philippines	19	70	87	150	765	870	1 613	2 586	...
Sarawak	3	8	28	55	89	71	129	188	
Pacific Area	*23*	*28*	*25*	*28*	*33*	*28*	*60*	*60*	**25*
of which:									
Australia	22	23	20	24	23	20	50	54	..
WORLD	*1 260*	*1 650*	*2 010*	*2 210*	*3 390*	*4 230*	*4 160*	*5 710*	*6 045*

* Unofficial estimate. [1] Includes poles, piling and posts. [2] Importers' figures; exports to countries of Western Europe.

the volume of both pitprop and pulpwood production have been about equal.

In the developing regions of *Latin America*, *Africa* and the *Pacific Area*, the big increase has been in the output of sawlogs, while the output of pulpwood and pitprops has not greatly changed. This is to be expected since sawmilling has in the past generally been the first stage in the growth of forest industries in new areas. The more complex industries, particularly pulp and paper, have followed rather far behind.

The increase in *Asia*'s apparent total production of industrial roundwood was almost entirely due to the rising output of Japan, the other countries of the region accounting only for a minor amount. But Asia is a region too vast and diverse to recognize general trends. The only country which can be discussed in detail is Japan where considerable wood-using industrial capacity, especially sawmills, already existed before the war. The available raw material supplies have since the war had to meet simultaneously heavy demands for sawn wood, for pitprops and for pulpwood. The pulpwood demand was especially strong from 1952 onwards, from many newly established pulp and paper mills. With better use of the available forest resources, much of the demand was able to be met but the sawmills inevitably suffered to the gain of the pulp industries which yield a greater economic profit.

The diagram shows how the production of the main wood-based commodities developed in the period under review. While removals of all industrial wood, as compared with the prewar level, rose by close to 50 percent, sawnwood production increased by some 40 percent, woodpulp and pulp products by about 70 percent, and fibreboard and plywood trebled. These figures

TABLE 6. – EXPORTS OF PULPWOOD

in thousands of cubic meters (r)

Region	1946	1947	1948	1949	1950	1951	1952	1953	1954
Europe	*924*	*1 888*	*3 292*	*2 584*	*2 870*	*4 285*	*3 511*	*2 198*	*3 633*
of which:									
Czechoslovakia	8	36	[1] 44	[1] 30	[1] 19	[1] 21	[1] 99	[1] 166	[1] 222
Finland	263	303	577	846	1 882	3 478	2 631	1 431	2 146
Germany, Western	*280	*1 050	*2 100	*900	133	13	8	15	
Poland	—	—	[1] —	[1] —	[1] 102	[1] 155	[1] 149	[1] 87	[1] 151
Sweden	157	106	117	129	255	169	183	207	581
Yugoslavia	*150	290	396	626	446	396	397	280	501
U.S.S.R.	*5	*10	[1] 12	[1] —	[1] 44	[1] 1	[1] 7	[1] —	[1] 1
North America	*4 868*	*5 261*	*6 008*	*4 126*	*4 493*	*7 355*	*6 401*	*1 488*	*4 641*
Canada	4 731	5 059	5 909	4 111	4 424	7 322	6 358	4 460	4 536
United States	137	202	99	15	69	33	43	28	105
Latin America	—	—	—	—	—	—	—	—	—
Africa	—	—	—	—	—	—	—	—	—
Asia	—	—	—	—	—	—	—	—	—
Pacific Area	—	—	—	—	—	—	—	—	—
WORLD TOTAL	*5 800*	*7 160*	*9 310*	*6 710*	*7 410*	*11 640*	*9 920*	*6 690*	*8 280*

* Unofficial estimate. [1] Importers' figures: exports to countries of Western Europe.

TABLE 7. – EXPORTS OF PITPROPS

in thousands of cubic meters (r)

Region	1946	1947	1948	1949	1950	1951	1952	1953	1954
Europe	*2 554*	*3 576*	*2 850*	*2 785*	*2 278*	*2 342*	*3 858*	*1 924*	*2 280*
of which:									
Austria	12	43	60	80	95	66	308	156	240
Belgium-Luxembourg	21	29	68	11	27	54	89	61	33
Finland	1 254	1 618	1 279	1 135	880	1 122	1 653	588	966
France	104	308	144	140	185	349	97	111	248
Germany, Western	638	980	574	*10	361	122	60	44	53
Germany, Eastern	*50	*100	[1] 97	[1] 135	[1] —	[1] 17	[1] 83	[1] 33	[1] 57
Norway	76	96	75	101	50	65	145	114	68
Poland	—	—	[1] —	[1] 69	[1] 216	[1] 3	[1] 134	[1] 76	[1] 124
Portugal	73	122	152	219	72	167	245	163	132
Sweden	230	195	195	659	242	317	1 000	552	330
Yugoslavia	–	15	149	189	114	22	4	6	1
U.S.S.R.	*20	*50	[1] 42	[1] 110	[1] 213	[1] 276	[1] 301	[1] 357	[1] 586
North America	*1 009*	*863*	*762*	*710*	*62*	*219*	*1 017*	*263*	*241*
Canada	1 009	863	762	710	62	219	1 017	263	241
Latin America	–								
Africa	*10	*10	*9	*1*	*5*	*5*	*3*	*1*	*1*
Asia	—	—	*29*	—	—	—	—	—	—
Pacific Area							—		
WORLD TOTAL	*3 590*	*4 500*	*3 690*	*3 640*	*2 560*	*2 840*	*5 180*	*2 540*	*3 110*

* Unofficial estimate. [1] Importers' figures: exports to countries of Western Europe.

reflect largely the changes in the industrial demand for roundwood as a raw material, although wood waste has been used increasingly for fibreboards.

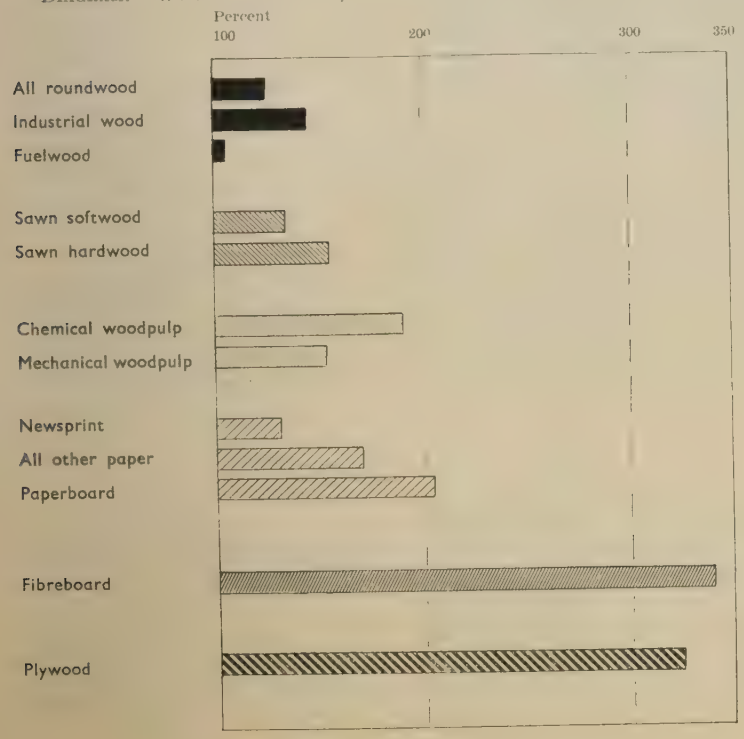
Roundwood trade

There has been a slow rise in international trade in roundwood during the past decade. But trade does not exceed three percent of the world production of industrial roundwood and is principally concentrated in *Europe*, as shown in Tables 4 to 7.

This European trade in industrial roundwood has varied between 3 and 6 percent of the total production in the region, the main categories concerned being pulpwood and pitprops. The volumes involved have amounted to about 10 to 15 percent of the region's total output of the commodities. The flow of trade in roundwood is mainly from the northern countries to the other parts of Europe. This reached its highest level in 1951 and 1952 when there was heavy buying by the main importing countries. Prewar these countries drew considerable supplies from the Soviet Union and Eastern European countries. Closure of this flow has since the war contributed to the pressure on export supplies available from northern Europe. Trade in pitprops and pulpwood has shown strong fluctuations but in 1954 pulpwood had increased by nearly 300 percent as against 1946, while pitprops had declined slightly. Trade in other round timber has remained more or less stable. It is in general limited to exchanges between contiguous countries, with the exception of imports of fine hardwood logs from other regions, a trade which has shown a considerable increase during the period being reviewed.

In other regions of the world the volume of trade in roundwood remains rather insignificant, except between contiguous countries as in Europe. There has been an increased flow of pulpwood from Canada to the U.S.A., but the volume of pitprop exports from North America to Europe has declined. The trade in hardwood logs from the Philippines to Japan has shown remarkable increases from year to year. The Soviet Union has not resumed pulpwood exports at all, and has, in fact, become a pulpwood importer. Exports of pitprops have been resumed only slowly and on a much lower level than prewar.

DIAGRAM. - *World Production of Roundwood and Forest Products, 1954*



Trend toward greater self-sufficiency

The difficulties encountered by most countries of the world after the war to meet their wood consumption needs, the realization that the days of cheap imports are over, and the growing awareness that, with some capital outlay and a little trouble, trees can be grown as a crop in most countries, has led to a distinct trend toward greater national self-sufficiency. Dependence on imported supplies of forest products had during the period from 1946 to 1954 proved detrimental on several occasions. Fluctuations in demand and prices have disrupted international trade with bad effects on levels and patterns of consumption.

In *Europe*, the principal importing countries are gradually succeeding in reducing to some extent their dependence on imports, although domestic pulp industries are still being created to meet the profitable demand for paper products, even at the cost of increasing imports of pulpwood. For pitprops, however, domestic sources of supply are increasingly being utilized and the total consumption of pitprops has been reduced, resulting in a considerable decline in Europe's volume of pitprop trade. Increased afforestation and reforestation efforts in a number of European countries, especially in the Mediterranean area, are tending to make those countries less dependent on imported supplies. In other regions, notable efforts towards greater self-sufficiency have been made, directed primarily toward better use of existing (chiefly broadleaved) forest resources, although considerable attention is being given also to "tree-farming" and to plantations of fast growing species to provide the raw material for sawmills, paper, and other manufacturing industries. The trend toward greater national self-sufficiency has in a few instances led to trade restrictions, either on imports so as to support domestic production, or on exports of rough or semi-finished products to promote conversion into more highly valued products. These cases have, however, been few and have not, so far, affected international trade to any general degree.

The Work of FAO

A Summary of Work in Forestry, 1954-55

Inclusion of forestry within the scope of FAO has given over the past decade a decided impetus to the development of forest resources and industries throughout the member countries of FAO. An accompanying feature worthy of special note has been the establishment of closer ties and understanding between producers (the forester and forest owner) and the users of forest products (industry and trade), and between both these groups and research specialists. Scientific analysis of the nature and extent of existing forests and of the demand for timber and its uses has increased while more attention has been given to the relation between the several aspects of forest development and between forestry and other segments of national economies.

Progress under the Technical Assistance Program continued throughout 1954 and 1955. Missions in 17 countries are concerned with forest production, while 16 missions are dealing with utilization and primary conversion of forest products. A training sawmill has been set up in Chile, in a forest area where correct management techniques can be demonstrated. Research centers for forestry or forest products have been organized in Burma, Iran, Mexico, Philippines, Thailand and Turkey. Preliminary work on regional research centers for the Near East and Latin America has been carried out.

A number of important meetings sponsored by FAO during the year included the Latin American Conference of pulp and paper experts at Buenos Aires, organized jointly by FAO, the Economic Commission for Latin America (ECLA) and the United Nations Technical Assistance Administration (UNTAA) with the Government of Argentina; and the Fourth World Forestry Congress organized by the Indian Government at Dehra Dun. As background to these meetings, two economic studies have been published, *World Forest Resources* and *World Pulp and Paper Resources and Prospects*, while a contribution was also made to the United Nations World Population Conference held in Rome in September 1954.

There has been increasing co-operation between FAO and other agencies interested in the field of forestry, notably with the regional Economic Commissions of the United Nations, the International Union of Forest Research Organizations (IUFRO), the Commonwealth Forestry Bureau, the International Union for the Protection of Nature, and with the United States Foreign Operations Administration (FOA).

The Forestry Division has co-operated with the Agriculture and Economics Divisions on range management and soil conservation, arid zone forestry, watershed management, economics and statistics. Outside consultants have been increasingly employed, some on a voluntary basis.

The supervision of work, under both the Regular and Technical Assistance Programs, is in some degree hampered by limited travel funds.

Haiti. *The future of the country is in their hands.*

Direction of Work

The office of the Director-General maintains responsibility for all forestry activities while direct responsibility is delegated after the initial stages to the technical officers concerned, to Technical Assistance officers, or to a regional forestry working group. The following section describes the work accomplished during the year under review.

Documentation

The collection and organization of reference documentation has continued. A member of the Commonwealth Forestry Bureau made a short visit to Rome in December 1954 to advise on how the technical reference service and forestry library might be used more effectively, and a reciprocal visit of an FAO staff member to the Bureau at Oxford was arranged. To keep abreast of current literature, the Organization makes use of the Centralized Title Service of this Bureau, issued in conjunction with *Forestry Abstracts*: also, the monthly bibliography published by the United States Department of Agriculture; and *Forstarchiv*.

Serial publications issued during the year, which analyse and synthesize the information obtained by FAO, are referred to in later sections. The established periodicals continue to

appear — *Yearbook of Forest Products Statistics*, quarterly *Timber Statistics Bulletin* with Economic Commission for Europe (ECE), and *Unasylva*. A special number of the latter, issued in connection with the Fourth World Forestry Congress, summarized the present situation in regard to forestry knowledge and progress. Two noteworthy papers appeared in *Unasylva* on "Forestry and Fundamental Education" and "Climatic Classification in Forestry."

The Joint FAO/IUFRO Committee on Bibliography, for which FAO provides two members and a secretariat, continued the work of producing official language editions of the English text of the *Oxford System of Decimal Classification for Forestry*, published early in 1954. At a meeting in Nancy in September, the Committee agreed on the procedure for producing a multilingual forestry dictionary, including terms and definitions, and the work of preparation has started. At the same time, FAO has been building up an Arabic glossary of forestry terms in collaboration with special consultants.

International collaboration

The Organization has continued to assist governments in the formulation of sound forest policies through international co-operation, relying for this purpose mainly on the regional Forestry Commissions which now include most member nations. The inclusion of the North American and African regions has also been discussed. Mention has been made of the World Forestry Congress, and of the Buenos Aires meeting and matters have been further discussed both at meetings concerned with other fields of FAO activity, and at those organized by other international agencies such as the International Union for the Protection of Nature.

The four regional Forestry Commissions (together with the joint European/Near East Subcommission on Mediterranean Forestry Problems — *Silva Mediterranea*) facilitate within each region the exchange of technical and economic information among governments with similar problems and conditions. The third session of the Asia-Pacific Forestry Commission was held in Tokyo in April 1955. The European Forestry Commission held its seventh session in Geneva in November 1954, and the eighth session will take place in Rome next October. The Near East Forestry Commission held its first session in Teheran in September 1955, and in October the fifth session of the Latin American Forestry Commission will take place in Caracas, Venezuela.

Near East

The holding of the first session of the Near East Forestry Commission was delayed to give time for substantial progress to be made in regard to recommendations formulated by the inaugural regional forestry gathering, the Near East Forestry Conference, held in Amman in December 1952. These included the creation of a regional forestry school for the Arabic-speaking countries, and the organization of a regional research center, for both of which institutions the Government of Syria has offered to act as host. Another project was the study of problems affecting both forestry and agriculture, such as range management which is so important for this region. The technical meeting on forest grazing, held in Rome in the spring of 1954, provided the necessary background. Mention has already been made of the compilation of the Arabic forestry glossary.

The activities of forestry Technical Assistance experts working in countries of the region, the organization of a highly successful seminar on forest policy in Istanbul in September 1954, and the contacts established over the past two years with the forest authorities in the various countries by the regional forestry officer stationed in Cairo, have all contributed to the progress of forest policy in the region.

Guatemala. *The first volume of the FAO Technical Assistance report,* "La Entomologia Forestal de Guatemala," *dealt with the various species of pines occurring in the country,* Pinus ayacahuite, P. strobus chiapensis, P. tenuifolia, P. pseudostrobus, P. montezumae, P. rudis, P. oocarpa, P. tecumumani, *and* P. hondurensis.

The second volume, recently issued, deals with the ambrosia beetles of the genus Dendroctonus *which are the most destructive pests of the pine woods of Guatemala.*

All species of this genus can infect completely healthy trees, although many species prefer diseased trees as hosts. Any conifer attacked reacts by an abundant secretion of resin, which often drives out or drowns the larvae. Nevertheless, their powers of resistance to secretions are considerable, greater than those of other genera of Scolytides.

According to the authorities, there are 25 species of Dendroctonus, *which live exclusively on conifers, and all of which, with the exception of one which exists in Europe, are indigenous to the continent of America, from Canada to Honduras. Their economic importance is considerable. The yearly damage still caused in the United States by various species is put at an average of $20 million. Four species of* Dendroctonus *have been found in Guatemala, three of which, namely* Dendroctonus adjunctus, D. mexicanus *and* D. parallelocollis, *appear to have very similar habits, while the fourth species,* D. valens, *is larger and more destructive.*

Latin America

In Latin America, Technical Assistance has been carried out on a large scale, the missions dealing both with specific problems and with the formulation of sound forest policies as a contribution to the economic development of countries of the region. The two largest Technical Assistance undertakings are in Mexico and Chile, while in the Amazon valley a forestry mission is taking part in a comprehensive project for the whole basin. Experts have taken part in the Central American Integration Scheme, carrying out appraisal of forest resources, preparing management plans, advising on methods of improvement of existing forest industries and the establishment of new ones. The possibilities were examined for developing pulp, paper and board

dustries in the Caribbean area. Lecturers have been assigned to courses in tropical forestry in Turrialba, in co-operation with the Inter-American Institute of Agricultural Sciences, and in Puerto Rico in co-operation with the United States Forest Service.

National progress reports on forest policy submitted to the fifth session of the Latin American Forestry Commission, to be held in Venezuela in October, 1955, show that progress in forestry is still slow, and that many governments attach too little importance to the place of forestry in their economy and for the conservation of soil and water. The meeting of pulp and paper experts organized in Buenos Aires in 1954, showed the contribution that this aspect of forest production could make to economic development.

Europe, including the Mediterranean

Following the publication in 1953 of *European Timber Trends and Prospects*, prepared jointly by the secretariats of FAO and ECE, the European Forestry Commission has attempted to promote a dynamic forest policy to overcome the problems of forest development in the region. The Commission is continuing to give special attention to the question of the small private forest, a pattern of land tenure which is of particular importance in Europe.

Technical Assistance activities were completed in Austria in 1954 but continue, although on a reduced scale, in Yugoslavia. A meeting of all the experts who have worked in that country was arranged for September 1955, when their recommendations were co-ordinated in a comprehensive development plan. In co-operation with ECE, certain members of the joint Subcommission on Mediterranean Forestry Problems, which held its fourth session in Athens in June 1954, are studying the contribution of forestry to the economic development of Southern Europe. A eucalyptus study tour in Morocco was organized by this body in October 1954.

The activities of the joint FAO/ECE Committee on forest operations and training of forest workers, and of its various working parties, are referred to later in this report, together with the work of the ECE Timber Committee which is jointly serviced by FAO and ECE. The European Forestry Commission's working party on torrent control and protection from avalanches, held a study tour in the Swiss Alps in July 1954 for the particular study of snow behavior, causes of avalanches, and defensive measures.

Asia and the Pacific

The third session of the Asia-Pacific Forestry Commission was held in Tokyo in April, 1955 attended by representatives of 18 of the 21 member countries. The majority of the countries in this region follow well-founded forest policies, although in some cases forest law and administration has not kept up with the development of forest industries. Certain important forestry problems, such as the control of shifting cultivation, remain to be solved, and Technical Assistance is chiefly concerned with this and other specific problems. These include control of the arid zone of Rajasthan in India, reforestation techniques in Thailand, setting up forestry and forest products research institutes in Burma, logging in tropical forests of Indonesia, and mechanical tree-planting in Ceylon. A training center on the application of statistical methods to tropical forestry and associated research will be held in India in late 1955.

The Asia-Pacific Forestry Commission has established a number of subsidiary bodies, including a subcommission on teak, working parties on grading and standardization, public education in forestry and watershed management, and two research committees on silvicultural and forest management research and on forest products research.

Fourth World Forestry Congress

The Organization assisted the Government of India during 1954 in the preparations for the Fourth World Forestry Congress. Ministers and delegations from all the States of India participated, together with representatives of professional and trade organizations. From abroad, 150 delegates from 45 countries and six international organizations also attended.

Tropical forestry was given prominence at the Congress and recommendations on management policies were made to assure fuller production from mixed tropical forests.

A number of recommendations of the Congress are being given effect by the Organization, while others are being submitted to the regional Forestry Commissions and to the Conference of FAO for consideration and decision. They will guide FAO action in the years ahead until the next World Forestry Congress, contemplated for 1960.

Technical Assistance

The number of experts engaged on direct advice and guidance in member countries in the middle of 1954 was slightly lower than in 1953. This was due to financial limitation on the operational budget.

By the middle of 1955, activities had recovered and 38 forestry experts were assigned to 19 countries. Three experts are working in three Central American countries, 15 in six South American countries, six in four Near East countries, 11 in six Far East countries, and one in Africa. This is a marked increase over the number of experts in the field in 1954, and both the number of experts at work and the number of countries of assignment represent the highest so far attained. Since the approval at mid-year of the 1955 supplementary Technical Assistance Program, a number of posts remained still to be filled during the autumn. It is, therefore, probable that, during the latter half of 1955, the number of forestry experts in the field will exceed 50. At the same time, the number of Technical Assistance officers at Headquarters to service the forestry program has been reduced from four to three.

The activities of the 38 experts in the field in June 1955 were classified as follows: *forest policy* — 11 experts, including legislation, administration, education, forest range management, and general forestry; *forest technology*, 23 experts, including ecology, silviculture, management, afforestation, logging, sawmilling and forest industries; *forest economics* — four experts, including survey and inventory, marketing and economic development. In Latin America, the field experts are equally divided between forestry proper and utilization. In the Near East, owing to different regional conditions, most of the experts are concerned with aspects of forestry proper, while in the Far East the majority are working on aspects of utilization.

Over the past 18 months, 42 final reports of missions have been published.

As regards Fellowships, 18 Fellows from nine countries were studying as of mid-1955 — the same number as one year earlier. An increase to 25 is expected during the latter half of 1955.

Forest Policy

Forest policy relates to activities necessitating considerable policy decision, although practically all the forestry work of the Organization involves at one time not only aspects of policy but also of technology and economics. To some extent, fortuitous circumstances have determined the exact projects handled under this title. For instance, work on poplar and chestnut described below, which properly belongs to the field of forest technology, is dealt with by staff of the forest policy branch.

Activities, already referred to in the section dealing with international collaboration, involve forest policy as does the technical supervision of the Expanded Technical Assistance Program work. In order to ensure that all undertakings are in conformity with the principles of forest policy adopted by the Sixth Session of the FAO Conference, an analysis was carried out, during 1954, of the forest policies and laws operative in the countries receiving Technical Assistance.

Special studies of certain policy issues of international concern, included types of forest ownership and their effect on forest management as part of the FAO work on land tenure and agrarian structure. A forestry staff member participated in the seminar on agrarian structure organized by FAO in Bangkok in late 1954.

The Division participated in a study of shifting cultivation, and two typical case studies relating to Africa will shortly be published as a forestry development paper, to be followed by two concerned with Latin America. A final analytical paper will appear in 1956.

Technical Assistance missions to advise on forest policy and associated matters are at work in Chile, Bolivia, Brazil (Amazon), Ethiopia, Iran, Libya and Paraguay. The Near East regional seminar on forest policy has already received mention.

Special policies

A program of work has been outlined for arid-zone forestry and control of desert conditions, following outstanding work carried in Libya under the Technical Assistance Program. A study on the policy, technical and economic aspects of growing timber outside the forest has also been started.

The International Poplar Commission, for which FAO provides the secretariat, met in Madrid in April 1955, when Argentina, Egypt, Iran, and Syria were elected as new members. Membership now includes countries from four continents. Canada and Yugoslavia have indicated their wish to join. Representatives of Finland, Greece, Pakistan and the United States of America (non-members), attended the session in Spain. Members of the Commission have co-operated with the secretariat in preparing a comprehensive monograph on poplars which will be published toward the end of 1955.

Preparations have been made for the third session of the similar commission formed to deal with *Castanea*, the International Chestnut Commission, which meets in Rome in September 1955.

The Permanent Working Party on Cork-Oak of the Subcommission on Mediterranean Forestry Problems met in Spain in May 1955. Discussions were held on the need for an accurate inventory of cork-oak forests to determine the areas where the future of this forest type is jeopardized by lack of regeneration or excessive exploitation, and the acreage that should be restocked each year in order to maintain an adequate growing stock. The policy to be followed is closely bound up with agrarian structure and forest grazing. Although there is increasing competition from synthetic products especially in France, Germany and the United States, cork-agglomerates are finding a greater number of uses.

Conservation

This heading relates to two types of activities; on the one hand, revealing the direct and indirect influence derived from forest cover and from associated lands, and, on the other, encouraging the development of services and agencies having responsibility for conservation and fostering a sympathetic public opinion.

A publication on forest influences is in preparation and will be issued in the FAO forestry study series. Attention has been mainly concentrated on forest grazing and range-management, in collaboration with the Agriculture Division. Forestry staff members have attended the meetings of the FAO pasture and fodder development working parties for the Mediterranean and Near East, and have also taken part in the training center on range management organized by the United States Foreign Operations Administration (FOA) in Iran in the summer of 1955.

Arising from the technical meeting on forest grazing, organized in Rome in March 1954, a technical panel has been established of specialists in range management, upon whom the Organization can draw for advice and information. With the help of this panel, two studies have been undertaken, one on the cultivation of trees for fodder, and the other on equipment and methods for eradicating noxious vegetation from both forest and range areas. The principles of range management and forest grazing, laid down by the Rome meeting, have been widely publicized among forest services through the regional Forestry Commissions.

The problems of watershed management are receiving increased attention. The working party on torrent control and protection from avalanches of the European Forestry Commission, has already been referred to. The Asia-Pacific Forestry Commission is now establishing a somewhat similar working party, and several Technical Assistance missions are operating in fields of [illegible] interest.

A technical panel on forestry education, as recommended to FAO by the Fourth World Forestry Congress, is in process of formation, whose first task will be to supervise the preparation of a revised edition of the FAO *Directory of Forestry Schools*. FAO has published a paper entitled *World Festival of Trees* and distributed extracts to school authorities under the title *School Forests*. Assistance has been given on preparing a manual on conservation for the Boy Scout Movement.

Forest Technology

Activities concerning the techniques of establishment, growing, protecting, harvesting and use of forest crops are handled by the Forest Technology Branch, which aims at obtaining a balance between production in the forest and fuller utilization of forest products.

All such activities must be based on research, and the Organization has continued to stimulate investigations in certain important fields.

A tropical silviculture consultant reviewed current literature and indicated future research needs. His summary was approved, with some modifications, by the Fourth World Forestry Congress and will be published in a volume on *Tropical Forestry*, now in preparation. Limited

Thailand. *Among the experts working in Thailand under the FAO Technical Assistance Program is a specialist in sawmill industries who, since 1953, has been attached to the Forest Industries Organization of the Thai Government advising on sawmill modernization.*

Part of the work carried out by the expert has been to design and construct a new lumber shed, 145 × 18 meters, by a prefabrication method not previously employed in Thailand. The shed was made up from a small range of standard wooden girders and trusses which were prefabricated to patterns marked out on a workshop floor and then hoisted and bolted together to form the new shed. By employment of this method the work was carried out largely by unskilled labor.

Yugoslavia. *Experts who have been working in this country are meeting Yugoslav Government representatives and technicians at Dubrovnik in September 1955, to discuss the problems connected with their missions, and coordinate the follow-up work on their recommendations.*

Expensive road transport is used to carry beech logs from the interior of Croatia over the denuded Velebit Coast Range to a small export port on the Adriatic.

Introduction of sustained yield management to Yugoslavia's forests is facilitated by construction of permanent forest settlements in the forests of Plješivica, Croatia.

financial contributions have been made to the International Union of Forest Research Organizations (IUFRO) for research on problems of special interest to FAO. The Organization provides the secretariat for IUFRO and staff members participated in the annual sessions of its Permanent Committee, in Nancy in September 1954, and Stockholm in September 1955. The Asia-Pacific Forestry Commission has asked FAO to establish regional advisory committees on silvicultural and on forest products research, and similar committees will probably be formed in other regions. The members of the FAO technical panels on wood chemistry and on mechanical wood technology exchange information on progress in research and on results.

Under the Technical Assistance Program, experts have been advising on the establishment of forest research institutes and forest products laboratories in Burma, Iran, Mexico and the Philippines, and on research programs in Thailand and Turkey. Progress has been made with the creation of regional research centers for the Near East and for Latin America.

Silviculture and management

Under the Regular Program, these activities are carried on chiefly in support of field projects such as the Technical Assistance missions carrying out investigations of silvicultural practices suited to the forests of the Amazon Valley, mechanized planting operations in Ceylon, management of natural forest and plantations in Chile, organization of a section on logging research and training at the Forest Research Institute in India, silvicultural methods and reforestation in Syria, and reforestation and afforestation methods and programs in Turkey. A number of publications in the World Forest Planting Manual series have been published, prepared initially by special consultants, including *Handling Forest Tree Seed* (also containing international seed testing rules), *Tree Seed Notes* (for arid areas and humid tropics), *Tree Planting Practices for Arid Areas*, and *Tree Planting Practices in Tropical Africa* (now in preparation). Similar papers are planned dealing with temperate and tropical Asia, while completion of papers on Latin America, Europe, and on *Choice of Species*, have had to be deferred to late 1955. A revised 1955 edition of the *Forest Seed Directory* has been issued, and the English text of *Eucalypts for Planting* is ready for publication.

Work has continued on the widespread introduction of eucalypts, and mention has already been made of the eucalypt study tour in Morocco. The Commonwealth Forestry and Timber Bureau, Australia, is preparing a comprehensive annotated bibliography on the genus, with some help from FAO, while initial preparations have been made for a world conference on eucalypts to be held in 1956 or 1957.

While the Organization endeavors to strike a balance between the interest of plantations and the management of natural forests, priority has so far been given to the needs of

those regions and areas where centuries of nomadism and overgrazing have led to the gradual and progressive ruin of the forest and serious soil degradation. This has meant much correspondence on seed problems, planting and tending techniques, and much time spent on the seed exchange clearing-house service. A subcommission on teak has been started in the Far East region and increased attention in the future will be given to tropical rain forest.

Utilization

In the report of its third session, the Asia-Pacific Forestry Commission was concerned that improved forestry practices and management were not keeping pace with the growth of new forest industries and the expansion of forest operations. Similar apprehensions have been expressed for other regions.

Many of the Technical Assistance missions concerned with forest policy are also advising on the systematic development of forest industries. Other missions directly concerned with various phases of industrial development have been conducted during the year in Chile, Colombia, India, Indonesia (pulp), Paraguay, Philippines (pulp), Thailand and Yugoslavia. Assistance has been given to the Chilean Government in the opening of the Llancacura demonstration sawmill while, in the Amazon Valley, FAO is assisting the Brazilian Government in the development of this area on the basis of forest industries.

Under the Regular Program, working parties of experts have been implementing the recommendations of the Third FAO Conference on Wood Technology, the report of which has been published. While the working parties are mainly concerned with securing standardization of methods of test of wood and wood-base materials, they are also preparing a systematic classification of wood base commodities, an agreement on principles of structural grading, and a manual on improving the small sawmill. They will report to a fourth conference in 1957.

Only limited attention could be paid to housing and improved use of constructional timber, but a major effort has been made in the pulp and paper fields as described elsewhere in this report. Consideration was given to the future scope of the work of the technical panel on chemical wood utilization, at a restricted meeting of members at Zurich in July 1955.

Equipment

To assist in improving forest productivity by the introduction of better machinery and equipment, the Organization maintains current documentation on machines and equipment manufactured throughout the world, and provides information on new equipment and the modernization of forest industries. Purchases are arranged under the Expanded Technical Assistance Program (ETAP) of material destined for experts, demonstration centers and training.

A new edition of the catalogue of wheel and crawler tractors has been prepared; a staff member attended a meeting in Lisbon in early 1955 of the International Standards Organization's group on tractor testing. A world directory of manufacturers of saws for primary conversion of logs is in preparation. "Equipment News" has appeared as a regular feature in *Unasylva*, and a series of separate *Equipment Notes* published: 42 such notes have been published to date and 45,000 copies distributed to technicians, services and organizations that have specially requested them. Information papers prepared by consultants and issued on stoves and ovens for [illegible] ing, and on movable and [illegible] for charcoal manufacture (in French only). Other papers have been issued on wire ropes and cables for [illegible] extraction, and wood chipper[illegible] dealing with forest and sawmill waste.

A technical panel of 120 specialists in the various fields of forest operations and wood-using industries advises the Organization on methods and equipment. There have been

Ceylon. *A Technical Assistance report on reforestation deals in part with the 100,000 acres (40,470 ha.) of mountain grassland called "dry patanas.*

The greater part of this area is grazed by the herds of flocks of the nearby villages. Unfortunately, uncontrolled grazing and the high winds in the dry season have killed the grass and severely eroded many areas. The livestock no longer have enough to eat and are in a deplorable physical condition. However, the sector assigned to the Forest Service, about 6,000 acres (2,400 ha.), is now almost completely reforested. In areas with adequate soil cover the whole area will be plowed, and the Forest Department will establish wind belts 20 yards (18 m.) in width, perpendicular to the main direction of the winds, separated by a distance of 125 yards (114 m.). Smaller wind belts 12 yards. (11 m.) in width, will be planted parallel to the direction of the winds, also separated by a distance of 125 yards (114 m.).

The Agricultural Department will take charge of the blocks between wind belts and manure will be introduced to improve the soil and good pasture will be grown. All the blocks will be fenced and the cattle will be allowed to graze each block successively according to a management plan and under the supervision of the village headman (with the advice of representatives of the Agriculture and Forest Departments).

The photograph shows the preparation of seed-beds for trees later to be planted out on "patana" areas.

meetings of the study groups set up by the joint FAO/ECE committee on forest operations and training of forest workers in June 1954; the group on principles for testing tractors for forest operations met in Geneva in April, 1955 the group on working methods and performance trials in Hamburg in May; and the group on vocational training of forest workers in Copenhagen, also in May. This group discussed measures for the safety of forest workers, a subject which is to be dealt with in a study prepared by the International Labour Organisation (ILO).

Forest Economics

Published in 1955, *World Forest Resources* gives the results in text and tables of the world-wide inventory undertaken by FAO in 1953.

Attention has been paid to improving the coverage, reliability and international comparability of forestry statistics. National statistics in the field of production, trade and consumption have been collected by Technical Assistance officers as part of their field work. A draft long-term program for forestry and forest products statistics has drawn up which will be discussed by special statistical working parties on definitions and classifications. As recommended by the Asia-Pacific Forestry Commission, preparations have also been made to organize statistical seminars in the Far East.

Technical Assistance experts have advised on carrying out forest inventories in tropical and subtropical countries including India, Mexico, Brazil, Ecuador, Iraq, Syria and Thailand on the interpretation of serial photographs, and compiling forest maps.

Forest Industries and Trade

An efficient service of current economic and statistical intelligence is maintained to cover the constantly changing pattern of production, consumption and trade in timber and other forest products, and a systematic attempt has been made to collate statistics, country by country, for the last ten years. Based on this material, commodity reports have been prepared and published in *Unasylva*, a review and outlook has been included in the *State of Food and Agriculture*, and regional problems have been reviewed in the surveys of the Economic Commissions of the United Nations.

The Timber Committee of the Economic Commission for Europe (ECE) for which FAO provides the professional secretariat, held its twelfth session at Geneva in November 1954, and the next session is being held in September 1955. The Committee's annual review of the timber situation covers the outlook not only for the ensuing year but for a longer period of two to five years ahead, in order to introduce a stabilizing factor in European timber markets for the co-ordination of forward felling programs.

The joint FAO/ECE quarterly bulletin, *Timber Statistics for Europe*, started in 1946, has continued to be published. The delay in publishing current statistics and market reports, has been reduced ,and a supplementary sheet with latest data has been issued. A new form of presentation will shortly be adopted. From 1 January 1955, new statistical series have been included, dealing with prices for pulpwood, pitprops and sawnwood, as well as for competing materials.

A working party established by the ECE Timber Committee to seek a formula for general conditions of sale for timber, met in May 1955. Delegates from 13 countries discussed possibilities of securing a measure of uniformity in grading of sawn softwoods.

Increasing attention has been paid in Technical Assistance work to marketing problems for forest products. Missions have been or are in process of being carried out in Mexico, Paraguay and the Caribbean Area to investigate marketing organization, market facilities and trading practices, both for internal and external markets. In the Far East, acceptable grading rules are being finalized for sawn hardwoods and for hardwood logs. Grading rules for teak, squares and sawn, are still under discussion.

Forest statistics and studies

Improved coverage of statistics of production, trade and consumption, is provided in the annual reference publication, the FAO *Yearbook of Forest Products Statistics*. The 1954 edition contained for the first time reliable world estimates broken down into regions, and included forest products other than wood. The arrangements for collecting, processing and publishing all the data have been improved so that future yearbooks should appear with less delay.

As a continuation of the program of the United Nations and its agencies for expanding world production of pulp and paper to meet prospective needs, FAO, in collaboration with the Economic Commission for Latin America (ECLA) and other agencies of the United Nations, organized the meeting of experts from the pulp and paper industry at Buenos Aires, to which reference has earlier been made. The meeting came to important conclusions regarding the technical and economic aspects of pulp and paper manufacture from tropical and sub-tropical hardwoods and agricultural residues, development prospects, financing, research and training. Its report, together with the FAO study on *World Pulp and Paper Resources and Prospects*, published in 1954, was submitted to the nineteenth session of the Economic and Social Council of the United Nations (ECOSOC) in May 1955. As a result, a group of experts has been assigned to the Latin-American region under the Technical Assistance Program to help countries to co-ordinate new pulp and paper production along sound technical and economic lines.

A study on timber substitution has been started in close co-operation with ECE. In addition to a general survey of world trends, based mainly on the relation between total sawnwood consumption and activity in the wood-consuming industries, investigations have begun in three selected fields (housing, mining and railway sleepers) to find out how far substitution has progressed, and what are the future prospects.

Technical Assistance Reports

A selection of titles of reports on forestry missions prepared by FAO Technical Assistance experts is given below. These reports, which are normally produced in one language only, are confidential documents and cannot be released for general distribution without the express permission of the Government concerned. Such permission is not granted in every case. The asterisk marks those reports available for general release.

AUSTRIA	
Application of Aerial Photography in Austrian Forest Inventory	D.A. Boon
Reforestation	R.F. Brown
Forestry Fund	J.A. de Vaissière
Investment Program for Forestry and Forest Industries	E. Glesinger
*Das Osterreichische Forschungsinstitut für Forstprodukte	G.M. Hunt
Die Forstliche Bundesversuchsanstalt für die Waldstandsaufnahme	M. Näslund
BOLIVIA	
Forestry	H.S. Kernan
BRAZIL	
*Forest Development in the Amazon Valley	R. Gachot, M. N. Gallant, K. P. McGrath
*Silvicultural Problems of *Araucaria angustifolia*	L.J. Rogers

Burma	
*Integration of Forests and Industries	J.A. von Monroy
Ceylon	
*Mechanical Logging	A.C. Decamps
Reforestation	C. Letourneux
Chile	
*Forestry Development (The Agricultural Economy of Chile)	E.I. Kotok
Colombia	
Planificacción forestal	M. van Bottenburg
Ethiopia	
Forest Policy and Forest Development	E.H.F. Swain
Guatemala	
*La Entomologia forestal	F. Schwerdtfeger and G. Becker
Vol. I - Los pinos de Guatemala	
Vol. II - La plaga de *Dendroctonus* en los bosques de pinos y modo de combatirla	
Haiti	
La politique forestière et sa mise en œuvre	L.V. Burns
Honduras	
*Extracción de resinas	H.W. Sandermann
*Silvicultura	C.E. Simmons
Iceland	
*Forestry	R.F. Taylor
India	
*Control of the Arid Zone of Rajasthan	A.Y. Goor
*Wood Technology	F.F. Kollmann
Indonesia	
*Logging	F. Cermak
Iran	
Forest Range Management	V.P. Carocci Buzi
*La carbonisation	E.E.F. Uhart
*La politique et la législation en matière forestière	E.E.F. Uhart
Iraq	
*Poplar Cultivation	E. Allegri
*Eucalyptus Cultivation	L.D. Pryor
Korea	
Forestry in South Korea	Sir Herbert Howard
Libya	
*Forestry	J. Messines
Forestry Activities 1952-54	J. Moser
Malaya	
*First Regional Timber Grading School	C.O. Flemmich
Mexico	
La Creacion de un Centro de Investigación Forestal y de un Laboratorio de la Celulosa	P. Bellonard
Silvicultura	D.T. Griffiths
*El Problema forestal de México	L. Huguet
*La economía de la industria de la madera de pino	P. Pöyry
La Industria resinera	H.W. Sandermann
Near East	
*Forestry Policy Seminar (Istanbul)	
Nepal	
Forestry	E. Robb
Pakistan	
The Medicinal Plants of West Pakistan	G.M. Hocking
Integration of Forests and Industries	J.A. von Monroy
Paraguay	
*Politica forestal y fomento de los recursos forestales	E. Saari and J.J. French
Philippines	
*Far Eastern Mechanical Logging Training Center	H.G. Keith
Thailand	
Reforestation	C. Letourneaux
Uruguay	
Afforestation in Uruguay	L.J. Rogers
Yugoslavia	
L'utilisation de déchets du bois	F. Bender
L'industrie des contreplaqués	J.S. Bethel
*La politique forestière	J.A. de Vaissière
*La conservation des sols	A. Dugelay
*Die Rationalisierung der Holzexploitation in Gebirgsgebieten	A. Huber
*Seed and Genetics	C. Syrach Larsen
*Die Methoden zur Verbesserung des Zuwachses und der Produktion der Wälder Jugoslawiens	H. Leibundgut
*Fast-growing Tree Species	J. Pourtet
*Les problèmes de reboisement	J.L. Prax
*Kiln Drying	E.J. Sahlman
*Sur la réorganisation de l'Institut du bois à Zagreb	C.W. Scott
*Le déroulage et le tranchage des bois	J. Venet

Equipment News

Interest in the development of forest utilization and woodworking industries is reflected in the continual demand for information on new equipment. The Forestry Division, FAO, collects such information and passes it, on request, to Member Governments: a selection is published here. FAO accepts no responsibility for the claims of manufacturers.

SWIVEL FRAME. — This frame permits front and rear halves of a truck to rotate to either side independently, keeping all wheels firmly on the ground, with complete protection for cab, body and load on very rough terrain. Frame consists of a heavy-duty steel box section with frame innerliner fastened to forward half of truck frame, a similar section fastened to rear half, both joined together by a high strength alloy steel tube (the swivel point for cab and body). Truck's drive line operates through swivel tube in heavy-duty models and beneath the tube in light models. Available for all makes of trucks.

Manufacturer: The Truckstell Manufacturing Co., Union Commerce Building, Cleveland 14, Ohio., U.S.A.

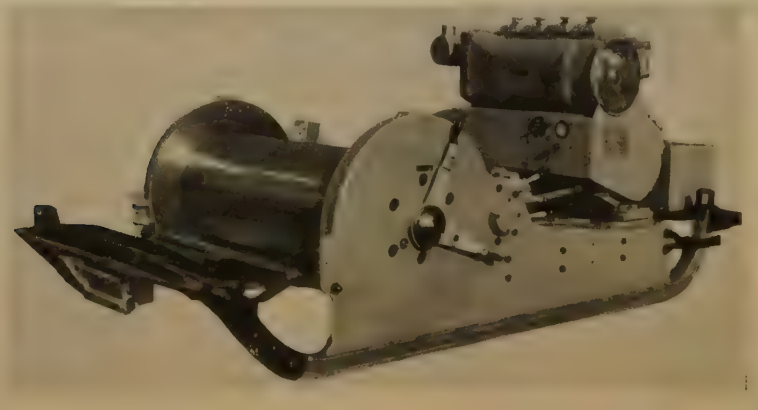
IMPROVED HANDHOOKS. — Handhooks or tongs are applied to the ends of logs, ties or bolts, and furnish a sure grip for two men to lift and handle pulpwood. The hook continues to bite as long as an upward pull is exerted, while double claws keep the bolt from turning.

Source: Equipment Survey Notes, *Forest Products Laboratory, Forest Service, U.S. Department of Agriculture, Washington, D.C., U.S.A.*

HIGH-CAPACITY PORTABLE FIRE-PUMP. — Self-priming centrifugal pump designed for fire fighting in isolated locations.

Specifications: 2-cycle engine; automatic rewind cable starter (no ropes); delivers 250 U.S.gal (964 liters) per min.; develops pressure over 100 lb. per sq. in. (7 kg./cm²); primes at 25 ft. (7.6 m.) suction lift; delivers fog, steam or foam.

Manufacturer: McCulloch Motors Corp., Export Dept., 301, Clay St., San Francisco 11, California, U.S.A.



YARDER FOR SKYLINE CRANE. — This W-60 model winch is designed for loads up to 3 tons. It has a large capacity drum to take operating cables of max. length 2,800 m.

Specifications: air-cooled 57 h.p. diesel engine, 4 cylinders, 6 gears 3 to 36 ft./sec. (1 to 8 m./sec.). Hoisting and skidding speed with full drum 3 tons at 3 ft./sec. (0.9 m./sec.). Max. traveling speed of load on skyline 33 ft./sec. (10 m./sec.) downhill, 20 ft./sec. (6 m./sec.) uphill. Larger skyline crane for loads up to 5 tons under trial.

Manufacturer: Wyssen Skyline Cranes, Reichenbach (Kandervalley), Switzerland.

DRIVALL POST DRIVER. — This tool drives a post directly into the ground without removing any earth. The driving tube rides over the post on the piston principle enabling maximum power to be concentrated on the head of the post. Hand operated by one or more men according to the size of the post. Manufactured in a range of sizes.

Manufacturer: Drivall Ltd., Hadley Highstone, Barnet, Hertfordshire, England.

HOLDER [illegible] SAWS. — The Sandvik [illegible] No. 127 is [illegible] pulpwood saw blades. [illegible] securely inserted in [illegible] for filing in the [illegible] to a bench in a file sh[illegible] of screws or clamps. [illegible] held rigidly so that vibrat[illegible] inated.

Source: Equipment Handl[illegible] *American Pulpwood As[illegible] Manufacturer Sandvikens Jern[illegible] Aktiebolag, Sandviken, Sweden.*

ROTO-GARDENER. This machine can be used for digging, weeding, hoeing, and levelling. It has steel tines placed in front of the power unit and rubber-tired wheels adjustable to alter depth of cultivation. Attachments are: rotary grass cutter; ridger; trailer of 2 ½ cwt. (127 kg.) loading capacity; drive wheels; adjustable tool bar; weeding hoes; full width tines; hook tines; leveller; snow plow.

Specifications: cut of tines 13 in. (33 cm.), 16 in. (41 cm.) or (by addition of extra tines) 24 in. (61 cm.); motor 120 cc with ½ Imp. gallon (2.3 liters) tank.

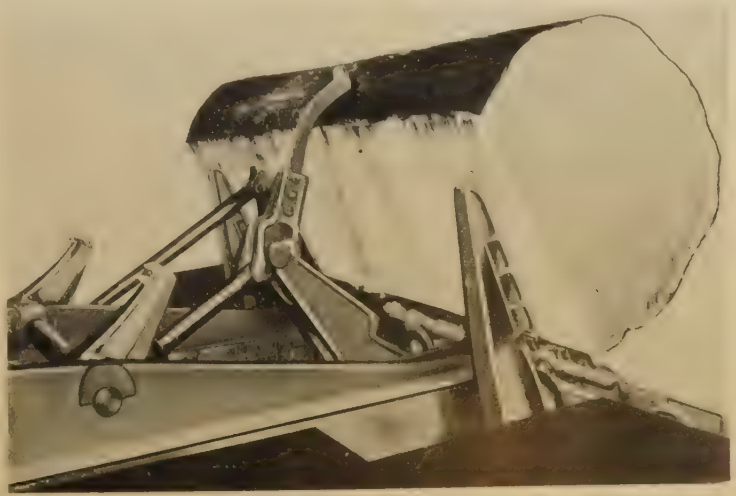
Manufacturer: J.E. Shay Ltd., Basingstoke, Hampshire, England.

THERMOBLOC HOT AIR GENERATOR. — This generator, which can be used as drying equipment in industrial concerns, functions on wood waste (sawdust, chips, shavings, bark) as well as on all other types of combustibles. Is manufactured in three models: 75,000 cal/h or 300,000 British thermal units; 125,000 cal/h or 500,000 BTU; and 225,000 cal/h or 900,000 BTU.

Etablissements Wanson, Boulevard de la Woluwe, Haren-Bruxelles, Belgium.

LOG TURNER. — Used in conjunction with skid lifts. When skids are raised by means of their lift, the forward upper corners of skids extend over 1 in. above top of carriage head blocks, forming fulcrum point to turn log when it is pulled backward by hook arm. Hook is thrust down into the log by motion of piston in hook arm cylinder being reversed. Continued reverse motion pulls log backward toward heel formed by skids, turning it and exposing new surface to saw. Hook arm works loosely on shaft, and on its upward stroke engages jaw clutches which are keyed to shaft, raising push and helper arms into a position to hold log while turning, and push it back onto carriage head blocks. Push and helper arms keyed solid to shaft and operated by push arm cylinder. Size of logs handled depends on carriage opening: 10 in. (25 cm.) turner recommended for opening 60 to 72 in. (1.5 to 1.8 m.), 12 in. (30 cm.) for 72 to 84 in. (1.8 m. to 2.1 m.), 14 in. (36 cm.) for openings over 84 in. (2.1 m.).

Manufacturer: The Filer and Stowell Co., Milwaukee, Wisconsin, U.S.A.



SHOP CADDY HYDRAULIC LIFT. — This hand truck hydraulic lift enables one man to load and unload trucks and stack merchandise.

Manufacturer: Precision Equipment Company, 3714, North Milwaukee Ave. Chicago 41 Illinois, U.S.A.

ADW MODEL BAND SAW. — Electrically driven band saw for cutting logs; carriage fitted with rapid dogging and dividing apparatus.

Specifications: diameter of saw pulleys 1.1 m., width of pulleys 100 mm., max. height under guide 1.02 m., max. length of blades 7.3 m., cutting speed 2.25 to 30 m./ min., constant return speed 47 m./min. Oil-type friction clutch. Blade guard. 6 mm. carriage with 4 dogs to saw 7 m.

Manufacturer: Etablissements Guilliet. Auxerre. France.

IRION SIDE FORK LIFT TRUCK. *Specifications:* Power for 600 mm., 3,000 kg. load center. Length of fork lift 1,200 mm. box-type frame; Mercedes-Benz 4-cylinder, 4-cycle diesel engine. H.p. 30 at 2,500 r.p.m. Mechanical clutch. Working speed: in 1st - 4 km./h.; 2nd - 7 km./h.; 3rd - 11 km./h.; 4th - 25 km./h.; in reverse - 4 km./h. Hydraulic system: working pressure - about 160 atm. under 3-ton load.

Manufacturer: Albert Irion, Nachf., Stuttgart-Münster, Germany.

PLANER. This planer comes in three models — the 700, 800 and 1,000.

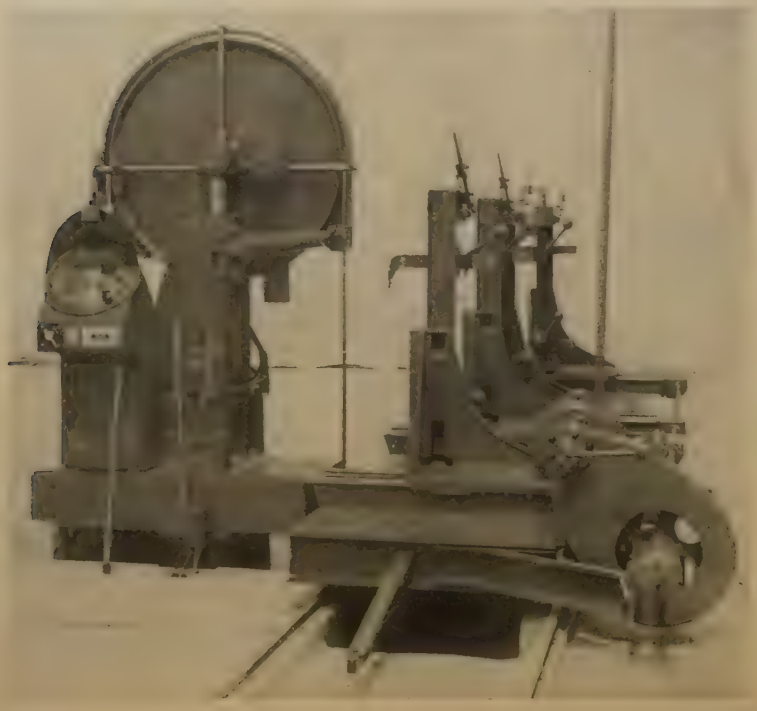
Specifications: working widths 702, 802 or 1,002 mm., thickness 240 mm., cutter speed 5,000 r.p.m., diameter of cutter spindle 134 mm., diameter of cutting circle 138 mm., number of cutters 4, diameter of feed rod 117 mm., 4 feed rods, rate of feed 6-25 m./min. or 12-50 m./min., 6 feeding speeds, weight of machines 2,000 kg. 2,500 kg., and 3,000 kg., floor space 2.676 m², 2.837 m², and 3.159 m² respectively.

Manufacturer: Machines Outils à Bois, Maison Y. Chambron. 11 rue de la Gare, Lyon (5ème), France.

STRAIGHT LINE CROSSCUT SAW. — A light type of machine for the cabinet, joinery, toy and packing case trades. Graduated scales are fitted for quick setting of the saw to required angle. Can be used for cutting simple and compound bevels, hatching, halfing, scarfing, tenoning, molding and rebating with circular cutter block.

Specifications: diameter of saw 12 in. (30 cm.); r.p.m. of saw 2,800 at 50 cycles; length of stroke 16 in. (41 cm.); depth of cut 4 in. (10 cm.); head swivels 45° right or left; head cants 90° to horizontal; motor 1 or 2 h.p. 3 phase, push button starter.

Manufacturer: H. Todd and Son Ltd., Brownhead Works, Eastern Avenue, Burnley, Lancashire, England.



News of the World

The items appearing here are condensed from newsworthy material collected by FAO staff or submitted by [illegible]. FAO assumes no responsibility for statements and statistics in items accepted in good faith from contributors.

Albania

• Forests cover about 1.1 million hectares, representing 41 percent of the total land area which is less than a hectare per head of population. Relatively, Albania has the largest extent of forest among central and southern European countries. One-fifth of the stands consist of conifers (predominantly pine and spruce), while oak and beech are the main hardwood species. Some half million hectares support high forest, the remaining 600,000 hectares being coppice and brushlands.

Due to the hilly and mountainous character of the country and to the fact that most forests occur in areas 900 meters above sea level, forest exploitation was in the past unevenly distributed. Easily accessible stands were heavily overcut while in other areas, especially in the north and northeast, difficulties of access prevented full use. By the end of the 'forties some 20,000 hectares had been clearcut and extensive areas deprived of timber of any commercial value.

All the forests of Albania were nationalized in 1944. At the beginning of the 'fifties rehabilitation work started. The 1949-50 two-year plan made some provision for afforestation and forest improvement, but work did not start in earnest until the period of the first five-year plan from 1951-1955. Priority in afforestation has been given to quick-growing species of conifers, eucalypts and poplars. Up to 1953, about 6,000 hectares had been afforested and more than 30,000 hectares of malarial swamps in coastal districts drained and partly afforested with eucalypts. Whereas in 1938 only four tree nurseries existed, today there are reported to be about 70, each averaging one hectare, and producing annually more than 16 million plants.

Forest grazing is widespread all over the country, there being more than 1.5 million sheep and over a million goats. The new forest administration is aware of the fact that, in the past, goats have contributed very materially to deforestation and soil erosion, and an attempt is being made to regulate forest grazing.

Annual net growth of all forests (including coppice) is put at 3.8 million cubic meters, but in order to restore the productivity of the forests, allowable cut and fellings are kept below this figure. Annual fellings are estimated at about 3 million cubic meters, a fifth consisting of industrial wood. Due to the lack of adequate roads, mechanization is not far advanced and timber hauling is still mainly done by animals (oxen, horses, buffaloes, asses and mules). The timber industry has been modernized; the nationalized sawmills have increased their output from 30,000 cubic meters in the 'forties to about 100,000 cubic meters. With the help of foreign credits and deliveries of machinery, two modern dry-kilns, one plywood factory and one impregnation plant have been established, and production of parquetry and sliced veneers has been started in recent years.

Foreign trade is a state monopoly and is conducted by an import-export agency. Although no figures are available, it is reported that Albania has become a net exporter and is shipping abroad much oak and beech sawnwood, parquet flooring, veneer logs, veneers and charcoal.

Argentina

• Interest in growing plantations of *pino paraná* has increased greatly in the past 15 years in the area contiguous to its natural habitat, the southern States of Brazil and the northeastern part of the Misiones Territory in Argentina. In the forests of the latter Territory, *Araucaria angustifolia* is spread over an area of about 400,000 hectares, of which about 25,000-30,000 hectares are well stocked with this species, in association with *Ilex paraguariensis* (Yerba maté). Scattered trees occur much further south which is attributed to the habit of a bird, the *arraca azul* (*Cyanocorax chrysops*), that gathers and buries seed which often subsequently germinates.

Ordinarily natural regeneration of *pino paraná* is difficult in Misiones because the ripe seed when it falls in April and May is eaten by wild and domestic animals, and is also collected by the local people who eat it roasted or boiled. Fire commonly kills off any young plants that succeed in establishing themselves.

Various private companies have embarked on making *pino paraná* plantations on a large scale and the Government is providing credit facilities to planters through the *Banco de la Nación Argentina*. It is also drawing up planting programs through the National Forests Administration, and has set up a special agency for this purpose at the General Manuel Belgrano Settlement in San Antonio, where study is made of all problems relating to the successful planting of this species.

The silvicultural system adopted is clear-cutting followed by direct seeding, which is considered better than using plants because the seedlings are sensitive to transplanting. In general, the techniques employed are similar to those described for Brazil in the article "Reforestation of Paraná Pine" which appeared in *Unasylva*, Vol. VIII, No. 1 (1954). That article, however, advocated the planting of seedlings rather than direct seeding, following the techniques developed in Australia for raising *Araucaria cunninghamii*.

Australia

• A newspaper report states that scientists of the Commonwealth Scientific Industrial Research Organization have discovered in the Australian tree known as *Alstonia constricta*, or "bitter bark," a new source of supply of the drug "reserpine" which is used in the treatment of high blood pressure and hypertension, and is scarce throughout the world. The bitter bark exists over a large area of northeast Australia, and two firms are interested in producing the drug from it.

Brazil

• A member of the FAO forestry mission for the Amazon, reporting on the inventory of selected forest areas which has been in progress over the past year, writes of the sampling of forest on the slopes and foothills of the *planalto* (see "The Amazon Valley" *Unasylva* Vol. VII, No. 3) and on the *planalto* itself around Santarém. In 45 working days the party was able to make 57 samples of one hectare each. Over 130 kilometers of transects were made, of which approximately 125 kilometers could be used for sampling purposes.

The *planalto* forest on heavy clayish soil is easily the best forest, with an average volume of growing stock per hectare of about 225 cubic meters, of trees 25 to 35 centimeters in diameter and up. The forest on the slopes and foothills on more sandy soil may be classified as degenerate *planalto* forest with an average volume of 143 cubic meters per hectare. The savanna or *catinga* forest on pure sandy soil on the slopes represents the last stage of degradation with a volume of only 34 cubic meters per hectare.

The results of the field work in the Santarém region so far, using the

ilable aerial photographs, may be summed up as follows:

1. The vertical pictures are good but too hazy for properly recognizing tree species. The maps made up from the verticals have been found to be accurate on the ground.
2. The oblique pictures are only good for rough orientation and practically useless for identification of tree species and special features of the major forest types.
3. With the help of the photographs and maps made from them, the samples on the ground could be located with sufficient accuracy.
4. The types of tropical forest so far sampled are reasonably uniform.
5. The data now obtained are adequate for mapping the forest types over a sufficiently extensive area.

Belgian Congo

• *Institut national pour l'Etude agronomique du Congo belge* (INEAC) has issued a contribution towards the scientific investigation of tropical forests, *An Ecological Classification of the Forests of the Belgian Congo*, Scientific Series No. 63. (90 pp., illus., Bruxelles, 1954). In concise form, substantial information is given particularly on the ecological and physiographical aspects of the various forest types of this vast territory. The authors admit that such a synthesis may appear rather premature as long as there still exist wide gaps in the analysis of various forest types. However, the value of this study lies in the fact that it provides a general framework without entering too far into details of merely local interest, yet which is flexible enough to allow incorporation of such detailed information resulting from extended research in the future.

Excellent work has been performed by INEAC in the field of agricultural research in the broadest sense. It has already published over a hundred outstanding scientific and technical works among which are a number of studies on forestry in the Belgian Congo, which may well pass for models in the field of tropical forest research.

Canada

• In his annual report for 1954, the President of the British Columbia Lumber Manufacturers Association dramatically indicated the rapidly growing importance to the pulp and paper industry of material formerly treated as waste. The increasingly integrated forest industries of the Pacific coast of Canada, by installation of barkers and chippers to handle mill waste and logs unsuitable for sawmilling, had produced enough pulp chips in 1954 to equal the annual growth of about one million acres or 400,000 hectares of productive forest land, operated on a sustained yield basis. This utilization of waste was made possible by the development of new equipment and the courage of the forest industry to spend large sums of money to install the necessary machinery. With expansion of chipping facilities continuing, an even greater improvement in waste utilization was to be expected in 1955.

• An editorial in the annual review issue (April 1955) of *Canadian Pulp and Paper Industry* comments on the fact that artificial fibres as a source of paper are coming out of the laboratory and into the realm of practical use:

> "They stand about where rayon fibres stood at the beginning of their introduction to the spinning and weaving industry for use in cloths. Today's prices for artificial or chemically produced fibre as compared with wood pulp or rag fibre are high but they may go lower as users who want the extra strength factors available create the markets that will allow higher production rates to lower unit costs.
>
> "If we look solely at the North American market, with its disturbing genius for invention, we might assume that these competitive new fibres might face the pulp industry with dislocation one day and temporary overproduction. If we see the world as a whole and if we accept the truth of today's assumption that for civilization to survive there must be a much more widespread distribution of a good standard of living around the world, then we must recognize the possibilities of an almost insatiable long-term demand for products of the pulp and paper industry and we may not be too fearful of what the scientist can unloose from research."

Chile

• An FAO Technical Assistance Officer writes that two recent graduates of the University of Chile's Forestry School, one now working as Assistant Professor in that School and the other as assistant in charge of the Llancacura sawmill (see *Unasylva* Volume 9, No. 2, pages 81-83), accompanied him on a two-day visit to the Cordillera Pelada, to the northwest of Llancacura. They covered 20 miles each day, on foot or horseback, sleeping in a *hosteria* or resthouse at about 1,560 meters (or 5,100 ft.).

About 4 kilometers east of this *hosteria*, they located a number of large recumbent "cushions" of *Dacrydium fonckii* (about 1 meter in diameter and 30 centimeters high), the only conifer of this genus in the western hemisphere. (Other species are well known timber trees in New Zealand and Indo-China). They report that the flora of the very windswept Cordillera Pelada is most interesting, including alerce (*Fitzroya*), ciprés de las Guaytecas (*Pilgerodendron uviferum*), stunted coigüe (*Nothofagus dombeyi*), better grown canelo (*Drimys*), *Drosera*, *Sphagnum* and *Lycopods*. In clear weather, the view from the summit is magnificent, embracing the peaks of the Andes over a north-south stretch of some 300 kilometers or 180 miles, and also the Pacific Ocean to the west. The case for trying to preserve some of this extremely interesting forest area, if only as a national park, is very strong. In the future there will be relatively easy access from a railway and a main north-south road.

The officer returned to Santiago with a party of 12 students from the Forestry School, visiting *en route* some of the chief forest industries and more important forests of south Chile. For a second successive year the party visited a private estate at Villarrica to see the excellent plantations of Douglas fir, (*pino Oregon*) *Cupressus torulosa* from the Himalayas and other exotics, and the 35 year-old pole crops of raulí (*Nothofagus procera*), regenerated naturally. The owner had an excellent German and Austrian staff who were doing first-class nursery and planting work. The growth of Douglas fir is very good indeed, and various interesting mixtures with other conifers and with hardwoods are being tested.

A large plywood plant at Curacautin was inspected which uses Chile pine, *Araucaria araucana*, a similar wood to *A. angustifolia* of Brazil and Argentina. The logs run to a diameter of 4 feet (1.2 m.) or more, from trees which appear to be from several hundred to 1,000 years old, with annual rings wider than those of alerce (*Fitzroya*), especially for the first 40 or more years of the tree's life, i. e., 8-15 rings per inch (2 to 4 per cm.), and then much narrower, though not so narrow as in alerce, about 20-35 rings per inch (5 to 9 per cm.) instead of alerce's 50 or so rings per inch of radius (13 per cm.). Large knots occur in the cores of these logs, and there are generally "leaf-traces" throughout the logs. The defect factor is quite high, sometimes causing a large core of as much as 2 feet (60 cm.) diameter to be left unpeeled; better logs are peeled down to a core of about 9 inches (24 cm.) only. The plant produces some 70 percent of Chile's plywood and exports to Argentina, the United Kingdom and elsewhere when markets are attractive. A sawmill, a box factory and a cooperage plant are attached to the main plywood mill. Some coigüe is cut or used in these, especially for cooperage, and some raulí.

The party was taken in trucks to visit one of the company's main *Araucaria* forests, to reach which they traversed the railway tunnel, Los Raices, through which in due course the railway lines will be laid to give another rail link between Chile and Argentina. This tunnel

is 4.5 kilometers long. The working area for the *Araucaria* was at about 1,400 meters. Tractors, dozers and cranes were being used effectively to handle the large logs. The roads were good, the terrain being not so precipitous or rocky as might be expected and road building therefore not unduly expensive. Lenga (*Nothofagus pumilio*) grows with the *Araucaria*, and ñirre (*N. antartica*) at lower levels, the latter seeding freely. Deep snow lies in winter, and work is possible in the woods for only four months of each year.

China

• It is reported that the Government is giving considerable attention to the restoration of forests and to the development of forestry in general. At present the forest area amounts to only 6.8 percent of the total area of the country, 72 percent of the forests being in State ownership. A central Ministry of Forestry, which was set up in 1950, plans to bring half of the existing forests under sustained yield management by 1957. Fire protection has been greatly helped by the formation of a voluntary fire-preventing organization with more than one million members. A forest industry department has been organized within the framework of the Ministry of Forestry. Two forest research institutes and six forest experiment stations have been opened, and over one thousand tree nurseries formed. Three forest academies and 11 forestry departments have been established in existing universities, at which 3,000 students are being trained. There are also 12,000 students attending technical schools to train as forest rangers.

Denmark

• A report to FAO states that, under the Ordinance of Distribution of Village Land of 21 April 1781, and the Forest Ordinance of 25 September 1805, the areas with the densest tree stands were defined as permanent forests, where grazing was prohibited, and the remainder were left at the complete disposal of the persons possessing grazing rights. Forests which were communally owned were also parcelled out, so that each owner had a wood-strip allotted to him as his share. Apart from this, a great many small woods have been established during the last 100 years, particularly in regions in Jutland which were previously heath, a considerable number of them coming under the advisory service of the Danish Heath Society.

An Act of 4 October 1919 provided that undivided tracts of woodland should not be parcelled out without the Ministry's assent, and that only 20 percent of a wooded estate comprising more than 300 hectares should be sold, it being forbidden to fragment the rest into lots of less than 600 hectares each. For some of these woods the Government secured preemption.

An Act of 3 April 1925 forbade the fragmentation of adjacent tracts of woodland into lots of less than 50 hectares, and the further splitting up of those under 100 hectares.

In almost all cases the owners of small woods are farmers who are usually more interested in farming and are apt to neglect the woodland, making heavy fellings, or else regarding it as a sort of reserve which is not to be touched in normal periods. Since the second world war, however, heavy consumption has reduced most small woods to an average level below that of bigger private forests and state forests.

The establishment of associations of owners of small woods has greatly improved the situation. Nevertheless only in about 50 percent of the small woods can forestry practice be described as good, in 50 percent fair. Working plans are only used in a few cases. About three-quarters of the small forests are under an advisory service of some kind.

The fragmented woodlands present a difficult problem as the owners of the sometimes narrow strips are disinclined to join the associations and are apt to care for their strips independently, disregarding the silvicultural difficulties or damage they may cause to the neighboring lots.

The Government inspects all private forests to see whether the principles of good silviculture contained in the Forestry Act are complied with, but it is considered essential that management should remain free so that owners do not lose their initiative and sense of responsibility.

Egypt

• Poplar or *hoor* trees have been present and utilized in Egypt for a long time, but now few trees of the *Populus nigra, P. alba* and *P. euphratica* varieties are left mostly in small areas in the north.

Recently, however, the Ministry of Agriculture has accepted the importance of growing poplar trees on a large scale, and several species and clones have been introduced from Holland, Italy and Syria. The Horticulture Department propagated many of these species in its nurseries and distributed the plants throughout the country to farmers, private landowners and trade nurseries.

Many factors limit the possibilities of growing poplar trees on a large scale and under natural conditions. The hot summers and the limited amount of rainfall during the mild winters limit the possibilities of cultivation to the northern part of the country. Where there is ample irrigation water, it is considered more profitable to raise field crops than to grow timber trees, and furthermore poplar trees are regarded as hosts to rust diseases and wood borers which infest field crops and orchards.

At present, poplar planting in Egypt is being encouraged to meet the demand for products such as matches, plywood, etc. It is hoped that poplar planting can be associated with croplands and farms and that an intensive agriculture may develop where crops, fruits and wood are cultivated together.

Germany

• The greatly increased volume of goods traffic between countries may be one of the reasons why many forests, particularly in industrialized regions, have in recent years become infested by a growing number of destructive insect species. On the other hand, technical development is providing more and more methods of fighting such pests. First of all, however, it is essential to know the insects that cause damage. To meet a need expressed by many practical foresters, a key has been published for identification of forest insects from pictures of the damage done to the trees, (Schimitschek, E.: *Die Bestimmung von Insektenschäden im Walde*, 1955, pp. 196, 290 illus., Paul Parey, Hamburg).

This is probably one of the first manuals of this kind to be published. Following the elimination method of botanical identification keys, the author uses as criteria the damage design mostly through feeding, and in addition, where necessary, a description of the insect stage actually performing the damage. This is mostly the larvae stage, in which cases the imaginae are not considered. Identification is facilitated by a broad classification of the types of damage into that done in nurseries, in young plantations, or among older growth, as well as according to wood species. Within these sectors further subdivisions are made according to whether damage is to leaves, sprouts, branches, stem, roots, flowers or seeds, etc. Particular emphasis has been given to insect damage to poplars and willows, species which are being increasingly cultivated. Fruit trees have also been included. Although this key has been established for central Europe and its use might appear to be limited to this region, it may be of considerable interest in other parts of the world as an example of a practical method of identifying insect damage in the forests.

Guianas

• In the summer of 1954, the Royal Tropical Institute, Amsterdam, organized for the first time round-table discussions among agriculture and forestry specialists from Surinam, British Guiana and French Guiana, to promote a mutual exchange of opinions on a non-official basis.

There has been growing local contact on technical matters between the three Guianas themselves, in addition to their co-operation in work carried out by the Caribbean Com-

-on, which has its headquarters at Port of Spain, Trinidad, on subjects of common interest to the various territories in the Caribbean area. The Guianas, which lie wedged between the great republics of Brazil and Venezuela on the tropical northern coast of South America, have a great deal in common in their climates, soils, historic development, and the composition of their populations. On the other hand, there are also striking contrasts, owing in a large measure to disparities in the constitutional development of the territories.

Problems of economic development have also many points in common and, as regards forestry and utilization, the meetings at Amsterdam produced a number of proposals which would assist in solving these problems. One possibility put forward was that the three Guianas should pool facilities for the technical training of sub-professional forest staff.

India

• In the special World Forestry Congress number of *The Indian Forester*, a plea was put forward by M. D. Chaturvedi, formerly Inspector-General of Forests, India, to save the Indian lion from extinction, especially since the Asoka Lions with the inscription "The Truth Triumphs" have been adopted as the national emblem. The lion, which differs little from the African lion, was once plentiful but today is restricted to the Gir Forest in Saurashtra, on the west coast of India to the north of Bombay State. It is protected, and the results of the protection have been encouraging, the last count placing its numbers at over 200, but the Indian Board for Wildlife views with alarm its restriction to one limited area exposed to the danger of epidemic or other unforeseen calamity. The Board has therefore recommended the development of an additional center in a locality similar to the lion's former habitat.

Israel

• On a recent official visit to the country, the Director of the Forestry Division, FAO, was shown the afforestation work carried out in Israel. Since 1948, the Government and the Jewish National Fund have done an equal share of the work and altogether about 40,000 acres (16,188 ha.) have been planted. In the previous 35 years, the fund had planted 5 million trees.

At Ilanoth, near Hadera, is the most important of the seven forest nurseries. It gathers 10 million seeds a year and produces 3 million seedlings. Seeds and seedlings are exchanged with government nurseries all over the world.

Seedlings are sent to settlements, to forest reserve areas in the hills and to places along the roads that are to be wooded. Pines and eucalyptus are used most. Poplars are developed to serve as windbreaks for orange groves. Acacias are set in sand dunes to halt the movement of the sand, and other trees are grown to meet special purposes and climatic conditions.

With the planting program moving rapidly, it is estimated that the woodland will supply one-third to one-half the nation's need for timber 15 years from now. There will be enough wood for soft-board factories, part of the amount needed for kraft paper and a sufficiency of poles and posts.

Italy

• According to the 1955 report of the FAO Italian National Committee, the main feature of Italy's forest policy continues to be the restoration of the country's forest resources.

Afforestation is being intensified both as a means of soil control and of putting barren mountain areas to economic use.

Imports of sawn softwood have shown an increase, while export of home production of softwood lumber has been reduced to a minimum. Exports of wood in the round of all kinds and of conifers in general, have been completely excluded. Cork exports have been encouraged whereas imports, either of cork or cork by-products, have been restricted to essentials only so as to safeguard the local Sardinian industry.

As a consequence of the fall of fuelwood and charcoal prices, due to the extended use of liquid gas, new lines of forest production have been sought. The Ministry of Agriculture and Forestry has already made special provisions so as to promote the transformation of coppice land, owned either by the State, communes or by other agencies, into high forest, to ensure a larger production of saw timber. The Government has also granted private owners of coppice land a subsidy up to a maximum of 75 percent of the total cost involved for this transformation.

Jordan

• A report of the fourth season of archaeological excavations at Jericho states that, to reach the highly important Neolithic stage, it has been necessary to clear the overlying levels of the Bronze Age. These in themselves are yielding material of much interest. Unfortunately, the cuts confirm the conclusion that the walls of the Late Bronze Age, the period of Joshua, have, at least in most places, been denuded away. They also confirm the strength and complexity of the defences in the preceding periods. One of the most interesting points which have emerged is the extent to which timber was employed in the third millennium, which may, with its implication of the cutting down of forests, explain the erosion of the surrounding slopes, which the evidence from the tombs shows took place between 3,000 and 2,000 B. C.

Libya

• A final report made by an FAO Technical Assistance officer proposes that a larger place should be given to fodder trees in all plantations in order to provide reserves of feed with which to counter the disastrous effects of drought on the numbers and condition of livestock.

Seeds of *Prosopis juliflora* (mesquite), *Gleditsia triacanthos* and *G. inermis* (honey locust tree) have been imported and the seedlings are being grown in nurseries. Instead of constructing hedges of useless *Acacia horrida* or *eburnea*, use will be made of honey locust trees (to be cut back when 3 or 4 years old so as to make the hedge thicker), which will rapidly yield crops of highly nutritive pods. The mesquites will be planted either on the dunes in partial replacement of *Acacia cyanophylla*, or near waterworks and in the principal beds of temporary wadis, in order to ensure that they get an occasional natural "watering."

The carob tree, 100,000 specimens of which are now being raised in nurseries, can be planted both in the coastal zone and on terraces in the well-watered parts of the Jebel.

New Zealand

• A report to FAO states that land-use committees of experts advising the Government examine available land and classify it according to whether it is to be used for Crown forestry purposes or for agriculture and pasture. Important areas classified during the last two years comprise:

(*a*) Urewera Maori Lands – indigenous forest on hilly to broken topography classified into:

- (i) protection forest for soil conservation and flood control;
- (ii) protection-cum-production forest;
- (iii) forest land suitable for conversion to agriculture.

(*b*) Part of the coastal sands on the western seacoasts of the North Island, classified into:

- (i) primary protective zone for stabilization of sand by development of protection forest;
- (ii) secondary protection zone for development of protection-cum-production forest.
- (iii) stabilized sand suitable for conversion to agricultural or pastoral use.

(c) Multiple-use Crown forests: forests whose main function is watershed protection, but which would have value as public recreation areas. Where the recreational and tourist value is paramount, such forest land has been placed under the control of the National Parks Authority for development. Where the protection value is paramount, the forests remain under the control of the Forest Authority which is charged to develop and encourage recreational use. Some 400 square miles (100,000 ha.) of Tararua State Forest have been placed in the latter category.

Portugal

• The Forest Service, organized in 1901, has up till now been governed by a law passed in 1926.

Recently, a complete revision of this law has been undertaken and new Forest Service Regulations, amended and brought up to date, have been published, in which the foresters' functions and duties in the protection and conservation of the country's forest resources are defined.

A chapter of the new law contains provisions relating to forests and land administered by the Forest Service and finally there are regulations for private holdings placed under the optional forest management scheme and "simple supervision" which require first:

> "that the holding to be placed thereunder be wholly or in part (at least two-thirds) predominantly forest land, and that there be a plan for reforestation, tending and extraction, drawn up by a forest officer and approved by the Minister of Economy."

Private holdings may enjoy certain benefits, even if they carry only scattered woodlots or groves along lanes, roads, valleys and waterways, enclosing agricultural plots or marking the boundaries of the property, or used as hedges or windbreaks, provided that the total area on which trees are grown equals one-third of the total size of the holding, and in all cases, goat grazing is prohibited.

Owners who fail to fulfill their obligations will lose their rights. Signs stating that the holding is under approved forest management must be affixed at various places along the property boundaries. A number of uniformed foresters proportional to the size of the holding will be assigned thereto.

The Minister of Economy may, at the request of interested parties, grant the privilege of creating hunting and fishing preserves, providing that the interests of the local populace are safeguarded and that the beneficiary landowners undertake to pay the farmers of adjacent lands for any damage caused to their crops by the game in the area. If it is proved that such hunting preserves are inimical to the public interest in a given region, privileges will be withdrawn.

Sweden

• The Boliden Mining Company announces that a new method of wood impregnation recently developed at its laboratories has now been working satisfactorily for over two years, with both pine and spruce wood (See also *Unasylva* Vol. 9, No. 1). It is called the pressure-change method and is designed specially for conifer wood. The tracheids of conifers are connected by pit membranes acting as sort of spherical valves for the transmission of the trees' sap stream. Since preservative liquids introduced lengthwise to the wood under constant pressure will block them and hamper the permeability of the wood, it is necessary to apply pressure and vacuum alternately, so that the passage is released for a moment, allowing a small quantity of preservative to enter the valve spheres.

For best results the amount of over- and under-pressure, the duration of the periods, and other factors must be carefully controlled. Tests have shown that, since the complete process of filling the wood tracheids with the preservative liquid does not run uniformly, the frequency of the pressure-vacuum period must be kept changing according to a specific program, which is governed by the combination of a filmband, a photo cell and devices to steer the pressure pumps. Under normal conditions, the time required for the full impregnation of wood does not exceed 20 hours, in which time roughly 800 vacuum-pressure periods are applied.

The particular advantage of this new method is that even green and wet pine wood can be impregnated, so that the operation becomes independent of the seasons and weather conditions. A disadvantage is the relative length of the full process. The necessary apparatus can be attached easily and cheaply to preservation plants of the traditional pressure type.

Switzerland

• Amendments which have recently been made to the Swiss Federal Forest Law are a good example of how a country's forest legislation can keep in step with changing ideas without overthrowing the existing foundations.

The present Swiss forest law is now 53 years old, and even its forerunner, brought into force in 1876, differed only inasmuch as its application was restricted to the country's high mountain forests, its object being to protect the forests against thoughtless devastation. While its basic conception is still sound, the development of forestry during the last 80 years has made i necessary to include new paragraphs from time to time. Such recent amendments were an article to facilitate the consolidation of small woodland parcels (1945), and another to provide funds for the reparation of avalanche damage to forests and for measures for avalanche prevention (1951). In a new supplement prepared by the Federal Government, the first amendment calls for training courses logging techniques to be compulsory for all forest guards, and subsidized by federal and cantonal governments. A second amendment authorizes the federal government to issue instructions regarding the control of pests and the supervision and treatment of attacked forests, as well as regarding the control of import, export and the trade in tree seeds, seedlings and other parts of trees liable to carry pest hazard.

The third amendment decrees that for all reforestation and afforestation in the country only seeds or plants of an origin known and suitable to the intended site may be used. The federal government is authorized to set forth rules relating to the import of foreign seeds and plants.

Lastly, the scale of fines is brought into conformity with the general rise in the cost of living index.

After adoption by Parliament of these amendments, the Swiss Federal Forest Law will no doubt again be found to be among the foremost national forest acts.

Trinidad

• The Land Allocation Policy for Trinidad, prepared in 1944 by the Lands Advisory Committee, was based upon sound principles. Only Crown lands suitable in soil and topography were to be allocated to agriculture. Lessees of such land would be bound by strict conditions of utilization. State acquisition of abandoned or badly managed land was advocated, resettlement on suitable agricultural land of persons thus dispossessed was to be effected, if necessary by reclaiming swamp land, or using areas not likely to be developed for oil production in the foreseeable future. Selected areas were to be declared forest reserves and non-agricultural reserves created for future urban, industrial or recreational development. Finally, the rehabilitation of degraded land owned or acquired by the Crown was to be initiated.

A recent progress report gives some interesting facts on developments since 1952. In view of the relative shortage of good agricultural areas, clearing of forest land on poor soils by squatters was becoming an acute problem and causing deterioration. The Forest Department has checked this by allocating areas for reforestation under a *taungya* system using teak. The project was at first viewed with suspicion but co-operation is now good. The maximum annual coupe is 65 acres (26 ha.) and the

... to be planted has been set, ... 1955, at 40 acres (16 ha.).

In other instances demands for land, aggravated by State acquisition, have been met by controlled long-term lease of scattered areas to adjacent private owners for the growing of timber or orchard trees; and research and scientific institutes have collaborated with the Agricultural Department in studying improved methods of farming, fire prevention and anti-erosion practices to enable otherwise marginal areas to be put into production by lessees under the three-year probationary and 25-year lease agreement.

The provision for nature reserves has been ensured within forests under conversion to teak plantations by demarcation at the rate of 50 acres (20 ha.) to every 1,000 acres (405 ha.) to be developed. The Forest Department has also developed promising techniques and successfully introduced several tree species for the reforestation of foothills and for use on poor soils.

Union of South Africa

• The Botanical Survey Memoir No. 28 of the Union's Department of Agriculture is a "summary" of nearly 200 pages on *Veld Types of South Africa*, based on over 15 years of collecting, field study and analysis. It undertakes:

1. to divide and describe veld types, defined as "a unit of vegetation whose range of variation is small enough to permit the whole of it to have the same farming potentialities"; the difficulty is that, of 15,000-16,000 species of flowering plants, about 2,000 are more or less important, and a total of 70 main types plus 75 variations is recognized.
2. to disentangle origins, migration routes and inter-relations of the types and their main components;
3. to identify and map the main large changes in types which have taken place, are continuing and may be expected to go on under grazing and farming use.

The work is, of course, designed for use in the Union, and unless the reader is already familiar with local Dutch names for type groups he will have difficulty.

Ecologists elsewhere, particularly those who hold that plant communities are to be defined in terms of vegetation, may disagree with some of the author's definitions.

The most interesting feature is the series of five maps showing the:

1. distribution of the ten main type groups in about A.D. 1400, as reconstructed from very sketchy historical evidence and the author's studies;
2. distribution of the type groups in 1950, solidly worked out;
3. estimated distribution in 2050, if current deterioration continues unabated;
4. distribution which could have been maintained by sound farming pratices, and the vegetation which will have to be reclaimed before there is any sort of stability in the Union's agriculture;
5. stage of deterioration in 1950; already desert, below and above critical stages, etc.

In total, the maps picture widespread deterioration, advancing at a rapid pace, mainly due to persistent and prolonged overgrazing by domestic stock. Some reference to counter-measures, for instance the very extended work in the same complex field in the United States, would have been appropriate.

United Kingdom

• The "volume-basal area line" which is the relationship that exists between the volume of trees and their sectional areas at breast height, is the subject of British Forestry Commission Bulletin No. 24 by F. C. Hummel. This relationship is used to prepare general volume tables by methods developed simultaneously by Hummel, Irvine, and Jeffers in Great Britain and by S. H. Spurr in the United States.

General tariff tables, that is, volume tables based on breast-height girth alone without differentiation of height classes have been prepared for all coniferous species for any site in Great Britain. They hold good, provided that the average height of the 100 largest trees per acre is less than 80 feet (24.4 m.). This new method of preparing such tables is simpler than previous techniques.

United States of America

• The editorial in the special number of *American Forests* (March 1955) devoted to the 50th anniversary of the United States Forest Service, describes as a disturbing element the fact that:

> "a sizeable cross section of the public persists in viewing the forester as a 'custodian' of land rather than as a 'land manager'. In view of our increasing population and the proportionately greater demands being made on land, this is a situation that must be corrected if our foresters are to grapple successfully with such problems as water management, timber production and other renewable resources, on the one hand, and land-use problems on the other which will call for the services of the best qualified technicians our schools can produce."

The only likely candidates for these posts, the editorial says, are professional foresters — provided they continue to show the necessary capacity for growth, imagination, and ability to adjust to rapidly changing conditions.

> "That the 'custodial' attitude of the public still prevails is indeed puzzling in view of the philosophy of leading foresters of yesterday and today and reported forestry advances on many broad fronts ... Young foresters of today are ... strong in their 'wise use' convictions. Ask almost any Forest Ranger if he regards himself as a 'custodian' and he will tell you he is a 'land manager,' and in cogent terms. To apply the 'custodial' tag to many an industrial forester would be like waving a red flag in front of a bull."

Yet, the 'custodian' concept is still part and parcel of the thinking of many intelligent people. Others seem not to realize that the U.S. Forest Service harvests forest crops at all.

> "This despite the fact that forestry on national forests today is a big business. Equipment owned by the Forest Service for timber management totals 34 million dollars. Capital investments on national forests (including the road nets over which forest products are hauled) are evaluated at 650 million dollars. Income from timber on these forests has topped 70 million dollars in one year."

• A series of performance tests with portable chippers are described in Station Paper No. 30 of the Lake States Forest Experiment Station. Two variations of the same model chipper were used. The first machine had 8 cutting knives operating at a cutting speed of 1,500 rpm. The modified model had 12 cutting knives operating at a cutting speed of 2,200 rpm. A 31-horsepower motor was used on both models.

The wood chips produced from material 1 to 6 inches (2.5-15.2 cm.) in diameter were small in size, ranging from about 0.5 inch (1.3 cm.) in width, 0.25 inch (0.6 cm.) in length, and 1/16 inch (0.16 cm.) in thickness to fine material the equivalent of sawdust. Chips from small brush less than 1 inch in diameter were coarse and irregular in texture and size.

Chips produced from rough wood by chippers of this type are not generally used by the pulp and paper industry mainly because of small size and lack of uniformity of the chips, high proportion of bark and leaves, mixture of species, and uncertainty of supply. If these objectionable features can be minimized, the low production costs relative to standard pulpwood should make it possible to market chips from sticks 1 to 4 inches (2.5-10 cm.) in diameter that are

currently being left in the woods on most pulpwood operations.

Portable wood chippers are useful for the disposal of orchard trimmings, for producing chips for livestock bedding, poultry litter, and mulch from available non-merchantable trees and other wood material in the farm woods.

These chippers are in current use on roadside and right-of-way slash disposal operations, for general slash disposal on logging operations in special areas of high fire hazard, or in recreational areas where slash burning is inadvisable for aesthetic reasons.

• A report of twenty years of the work of the Boyce Thompson Institute for Plant Research at Yonkers, New York, gives details of the basic seed research which it has conducted since 1924. The wide range of specialized equipment devised to control environmental conditions and isolate causes of germination difficulties has been used mainly for horticultural and agricultural seed problems, but also for some American forest tree species notable for germination problems.

Several broad types of seed treatment have been used, including after-ripening in dry storage; scarification, acid and other treatments of hard-coated seeds; after-ripening (stratification) in moist storage at various controlled low temperatures.

Special attention has been given to developing a rapid and sure viability test so that the true worth of seed may be readily and promptly determined. Tests have been made as well of many of the so-called growth-promoting or hormone-like substances as effecting germination. The general finding on non-dormant seed was that there was no beneficial effect.

Very detailed studies on seed storage methods show that dominant controls are moisture content and temperature. Various conifer seeds stored at a temperature of 23° F. either in open or sealed containers for periods up to six years retained all or nearly all of the one-year germination capacity effectively.

• *Forest Science*, Vol. I, No. 1, has made its appearance. It is published by the Society of American Foresters with co-operation from forest research and educational institutions to provide an outlet for research and technical papers either too long or too specialized to be handled by other professional journals, particularly the Society's *Journal of Forestry*.

The need for such a publication has long been recognized, and a long period of study lies behind the launching of *Forest Science*. Suitable articles in the whole field of forestry studies will be acceptable and the first issue includes papers on a wide variety of subjects.

Reviews of important works, including those of other countries, will be a regular feature.

• The Northeastern Forest Fire Protection Commission was organized after the great Maine fires of 1947. It includes the fire control organizations of the several member states and of the United States Forest Service, and is designed to provide mutual aid in fire suppression and to integrate the joint efforts of the several organizations which may be mustered to fight a major fire.

A problem has been to instruct and train members of the various organizations to a common understanding of plans, terminology and duties, so that, when crises arise, there shall be no confusion. To this end, the Commission and the Forest Service have recently developed a training manual of organization on big fires, based on experience gained during the past several decades, both in the region itself and elsewhere. It gives detailed description of the nature of the fire suppression job, the functions and duties of the fire boss, and of the various people in the three major groups of the suppression organization, namely the line unit, the plans unit and the service unit.

The emphasis of the manual is placed on the techniques of training and, in this field, note has been taken of applicable techniques developed in Army training. Details of the specific standardization requirements of the service unit are given, such as the gas and oil requirements for various types of equipment, hand tool lists for different types of cover, layouts for camp kitchens and food supply lists.

As organization on big fires has inevitably become more complex, such material is more and more necessary when various organizations must be welded into an effective team under the pressures of an emergency.

• Recent publication by the Society of American Foresters of *Forest Cover Types of North America* (*Exclusive of Mexico*) brings to a new stage the work begun by the Society twenty-five years ago to clear up the existing confusion by setting up a standard system of forest types for the eastern United States. A work on forest cover types of western North America followed, and now the present work includes also the types of Canada.

The accepted basis for recognizing forest types is the existing tree cover. In naming the types, the principle was to employ species rather than generic names which would be descriptive of the composition. When possible, type name was confined to a single species or a binomial, with trinomials used rarely. Predominance is judged by number of stems in the dominant and codominant classes combined, the predominant tree usually forming 50 percent or more.

In the east there are five great forest regions — Boreal, Northern, Central Hardwood, Southern and Tropical Forest and the recognized types have been listed and described separately for each forest region, further arranged into groups on the basis of soil moisture relations into dry, fresh to moist, and wet situations. Site is regarded as subordinate to type and is treated as such and the Society has formed type groups, each including two or more types, which are cross-referenced to the two other major and widely used type groups of the area, namely the Canadian (generalized coniferous, mixed wood and hardwood groups), and the United States Forest Survey system (economic values). The Society accepts 106 cover types for the east, broken down into about 16 type groups compared to 10 type groups recognized by the Forest Survey.

In the west, six natural regions are recognized — Northern Interior, High Mountains, Middle Elevations of the Interior, North Pacific, Low Elevations of the Interior, and South Pacific. These cannot be accurately mapped because of the complexity and rapidly changing elevation of the western mountains. About 50 types are recognized in the west, and these are cross-referenced to the ten type groups of that area as used by the Forest Survey.

For both east and west, each type is described as to definition and composition, nature and occurrence, transition forms and variance. Under the latter heading the typical replacement vegetation when the natural type is destroyed is described.

Union of Soviet Socialist Republics

• Four years have passed since the all-Soviet meeting on the classification of forest types took place, and foresters have continued to develop their ideas for improving classification. An article by Professor B.C. Nestorov on "The study of forest types and their classification" has been published in a recent issue of *Lesnoie Koziastvo* (February 1955), in the hope that researchers and practical workers will give their views on the present system of classification and its practical application.

A new broad definition of "forest type" was given by Academist V.N. Sukachev in 1950. "Forest type" should be understood to mean

> "all wooded areas identical in composition and fauna, in the complex of the conditions (climatic, soil and water) under which the trees grow, in the relations between their plants and environment, in the process of restocking and the evolutionary trend that makes itself felt there, and to which, consequently, uniform forest management methods must be applied."

Academist P.C. Pogrebniak proposed to define environment types as:

> "the grouping of areas where growth of forest vegetation is similarly affected, that is, showing the same complex of active natural factors (climate, soil and water). Several forest types may be found within one type of local growth conditions. In addition, however, each forest type has its own complex of soil and climatic conditions to the extent in which the latter depend on the vegetation."

Two types of classification were therefore recognized by plant associations or on ecological grounds, in that the system of V.N. Sukachev was recognized as a classification of forests, and that of P.C. Pogrebniak as a classification of local growth conditions.

The mere putting together of two classifications and, even more so, their automatic combination is far from sufficient to solve the whole theoretical question of forest type classification, and does not mean that further study is no longer necessary.

The incomplete consolidation of the Sukachev-Pogrebniak ideas with regard to classification of forest types appears from the fact that they are not entirely suitable in practice, when various errors frequently show up. The plant builder and indicator theories are not at all inconsistent and form " the two sides of the same coin, " but for this very reason common defects appear in the combining of these two lines of thought.

The classification now submitted in this article shows both stand composition by species and soil fertility. Example is given for two large geographic areas: the forest zone and the wooded steppe zone.

According to the new classification, in the forest and wooded steppe zones, for each major species (pine, fir, birch, aspen, oak, alder) there are seven different, main categories of forest types that group stands and local growth conditions by fertility classes.

In the middle, under the fourth category, fall all forest types, of the most fertile lands: moist clayey soils, clayey-silicious soils with intermediate layers of clay, clays and other similar types with optimum moisture content.

To the left of this category is the gradation of forest types of decreasing fertility; third category: stands, on moist, silicious-clayey and shallow clayey soils, etc.; then the second category: stands on moist sands; and lastly, the first category: stands on dry sands of varying physical structure. In the forest zone, in general, only pine grows on dry sands, while in the wooded steppe zone, clayey soils are covered with oak.

Likewise, to the right of the middle column, where the best forest types on the most fertile lands are shown (fourth column), there is a gradation of forest by decreasing productivity; fifth category: forests on river banks, near streams and torrents and consequently called humid by their situation; then the sixth category: forests on waterlogged soils (forest zone) or nearly always wet soils (wooded steppe zone); lastly, the seventh category: on marshy land (forest zone) and wet soils (wooded steppe zone).

In the forest type categories above, trees play the part of both site builders and indicators in the system defined.

For general use, the article suggests designating forest types by both over-all vegetation and site, using abbreviations made up of groups of letters such as Pd, Pms, Pssc, Omdc, etc. in which the capital letter refers to the first letter of the name of the species: P, pine, O, oak, etc.; while the small accompanying letters indicate local growth conditions: d, dry land of varying physical structures; ms, moist sands; ssc, moist silicious, and shallow clayey soils; mdc, moist deep clayey soils, silica on clays, and clayey, silicious-clayey soils; l, humid soils (because of the running water) alongside rivers, on river banks and in thalwegs; wl, waterlogged soils; w, wet; m, marshy soils; and vw, very wet.

• According to the periodical *Lesnoe Hozjaistvo*, the Plenary Meeting of the Central Committee of the Communist Party held in 1954 examined in some detail the activities of the Soviet forest authorities. Note was taken of the good results achieved by some forest farms (*lieskhozes*) and collective farms (*kolkhozes*), but there appeared to be also ground for criticism, especially regarding the insufficiency of the progress made by the *kolkhozes* in establishing windbreaks and shelterbelts. The Central Committee had advocated a great effort to bring under cultivation the unproductive lands of Kazakstan, Siberia and the Urals, and of certain regions of the Volga where shelterbelts were to play a primary role against parching winds. The afforestation work for the spring of 1954 was, however, only fulfilled to the extent of 55 percent of the planned area. Too often planting was carried out on badly prepared soil with poor quality seed and plants. Likewise proper planting techniques and especially after-care of the seedlings were neglected. The reasons for these failures were discussed and constructive suggestions made for future work.

A great responsibility for timber production will rest, during the next few years, on the *lieskhozes* and on their sawills and subsidiary forest products industries. Output in 1954-1955 is supposed to attain 125 percent of the previous year's production, and 200 percent within the next three years. The timber requirements of the *kolkhozes* and State farms (*sovkhozes*) are bound to increase greatly, particularly as a result of the expansion of livestock breeding and the need to have sufficient barns for overwintering stock.

There appears to be no difficulty in finding the necessary timber, in part from the *kolkhoz* forests themselves, which are, however, sometimes well but more often not well managed. The Government has earmarked appropriations to cover the expense of managing these forests properly. Another source is the so-called " group one " forest (see *Unasylva* Vol. 9, No. 1). This group includes forests in which, in view of their protective role, all fellings were prohibited at the time of the classification of the U.S.S.R. forests, save in exceptional cases. This has in many instances led to an accumulation of overmature timber which constitutes a potential danger for the propagation of harmful insects and diseases. Since 1952, the policy in regard to these forests has been changed. New management plans are being worked out and the shortening of rotations will make possible the extraction of relatively large volumes of timber.

A further contribution which the *lieskhozes* could make to the rural economy would be the opening up and systematic assignment to the collective farms of the land forming part of the State forest domain but which can be used for grazing by livestock. The estimated extent of such land is ten million hectares.

TIPOGRAFICA CASTALDI - ROMA - 1955

THE LITERATURE OF FORESTRY

THE APRIL issue of *Forestry Abstracts*, prepared by the Commonwealth Forestry Bureau at Oxford, contains an article appraising the present position of the literature of forestry.

Since the second world war the total mass of literature or "coverage" has grown formidably, in both volume and variety of origin.

Year	*Periodicals*	*Serial Sets (including Annual Reports)*	TOTAL
January 1947	379	470	849
March 1949	392	513	905
January 1950	416	544	960
„ 1951	445	602	1 047
March 1952	475	665	1 130
„ 1953	520	691	1 211
„ 1954	547	720	1 267
January 1955	555	755	1 310

SUCH PERIODICALS, it may be noted, currently include 23 weeklies, 15 semi-monthlies and 181 monthlies, the whole comprising an annual intake of over 5,100 issues. The serials include some 230 reports, mostly annual, from departments, research and teaching centers, and other professional bodies.

A superficial analysis of all this literature by origin is given below:

Region	*No.*	*Percent*
Commonwealth	490	37
Europe, including U.S.S.R.	316	24
Asia and Pacific (non-Commonwealth)	51	4
Africa (non-Commonwealth)	10	
United States	365	28
Central and South America	47	4
International	31	3
TOTAL	1 310	100

POSTWAR DEVELOPMENT or revival of organized forestry all over the world, much assisted by such United Nations agencies as the Food and Agriculture Organization, has resulted in the appearance or resuscitation of numerous publications carrying forestry material, while an increasing number are also becoming available from the countries of Eastern Europe. Abstracting is therefore faced with a growing diversity of tongues; since 1951, Greek, Icelandic, Javanese, Latvian, Macedonian, Persian and Siamese have all had to be arranged for, and a total of over 30 languages is now regularly dealt with.

Language	*1946*		*1950*	*1954*	
	No.	*Percent*	*Percent*	*No.*	*Percent*
English	2 500	73.5	70.0	2 780	61.2
French	305	9.0	7.5	370	8.3
German	195	6.0	6.6	565	12.4
Spanish, Portuguese, Italian, Romanian	175	5.0	6.3	280	6.0
Scandinavian and Dutch	110	3.2	3.3	245	5.3
Russian and other Slav	105	3.2	4.5	205	4.5
Oriental and other	5	0.1	1.8	105	2.3
TOTAL	3 395	100.0	100.0	4 550	100.0

Some idea of the share of different countries in the total output of forestry literature can be gained from an analysis by language of the periodicals regularly scrutinized by the Bureau. The above figures are based on *issues* of periodicals during the years given.

RECENT FAO PUBLICATIONS

The State of Food and Agriculture 1955 (Review of a Decade and Outlook)

September 1955 *$2.50 or 12s. 6d.*
236 pages, graphs and tables (English, French and Spanish).

UNLIKE its predecessors, this year's report on the state of food and agriculture does not deal mainly with the current situation and short-term outlook, but instead reviews the progress and experiences of the whole decade. The treatment of this theme is analytical rather than descriptive and an attempt has been made to bring out the underlying causes of the main postwar developments and to make some appraisal of the results achieved. The main issues and problems which lie ahead are discussed in a final chapter.

Part II (in the same volume) reviews the production, consumption and trade developments commodity by commodity (including forestry and fisheries) in the last ten years and gives short-term outlooks.

Activities of FAO under the Expanded Technical Assistance Program 1954-55

1955, 112 *pages* *$1.00 or 5s.*
(English, French and Spanish).

AN illustrated report covering all the fields of work in which FAO is rendering Technical Assistance in Asia, the Near East, Africa, Latin America and Europe. The material is presented so that related activities in forestry, agriculture, fisheries, and nutrition, are described chapter by chapter, each containing significant background information on the projects.

Eucalypts for Planting

October 1955, 400 pages. *$3.50 or 17s. 6d.*

THE English edition, with the addition of a complete index of the species mentioned, is now available.

One of the most versatile tree groups for the creation of new forests is the genus Eucalyptus. This monograph by a recognized authority summarizes available material on botanical and silvicultural characteristics, nursery and planting methods, and technological properties and uses.

1955 Forest Seed Directory

June 1955, 158 pages *$1.00 or 5s.*

World Forest Resources

March 1955, 120 pages, graphs and tables. *$2.50 or 12s. 6d.*
(trilingual: English, French and Spanish)

THE Conference of FAO, at its Sixth Session in 1951, directed that available information on the forest resources of the world should be collected and published at five-year intervals. The second of these enquiries was undertaken in 1953, and covered over 190 countries and territories. Compared with the first enquiry of 1947/48, this inventory records considerable progress in the scope of the figures reported.

A directory of suppliers of seed of woody species for forest production, erosion control, game and wildlife management, shelterbelts and wind breaks, and for animal fodder purposes.

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